DEAR GOVERNOR DAVIS AND MEMBERS OF THE CALIFORNIA LEGISLATURE:

The California High-Speed Rail Authority presents this business plan to you in keeping with the mandate identified in Chapter 796 of the Statutes of 1996 (Senate Bill 1420, Kopp and Costa).

This business plan represents fairly the interests of Californians for higher-speed mobility; details a practical approach to constructing, operating and financing a high-speed train system; and conveys a reasoned assessment of how California can accommodate the intercity travel needs of 45-to-50 million Californians in 2020. The recommendations in this business plan are economically feasible, publicly popular, and fiscally prudent for initiating an investment in California's infrastructure of this magnitude.

The business plan was prepared and adopted by nine members of the public who brought to this effort varied knowledge and experience in transportation, government, finance, real estate development, and business. Our members included a former president pro tempore of the State Senate, two past chairmen of the California Transportation Commission and a past chairman of the Los Angeles Airport Commission. These individuals have played integral roles in the development of the state's transportation infrastructure. As a result, we are very mindful of how that infrastructure has evolved to meet the needs of California's growing population, particularly since the end of World War II.

A Smart Investment in Mobility

Individually, and as a body, we have reviewed the demographic, engineering, ridership, and financing work of consultants with the credentials to undertake a project of this magnitude for California. We have approached our work as if we were a private entity investing our own money (which, of course, tax dollars are).

We find that a high-speed train system is a smart investment in the state's future mobility. It will yield solid financial returns to the state and provide potentially dramatic transportation benefits to all Californians. It is a system that can be operated without public subsidy. The public's investment should be limited to that which is necessary to ensure the construction of the basic system.

We directed our consultants to use very conservative assumptions in their operating revenue projections in order to develop a credible scenario. For example, the revenue assumptions were based on the high-speed train fare being 50 percent of one-way, walk-up airfares between San Francisco and Los Angeles. To maximize both revenues and ridership, our analysis indicates the optimum high-speed train fare would be between 70 and 75 percent of the San Francisco-Los Angeles airfare. We believe that the future scenarios set forth in the sensitivity analyses (see Table 3-8: Ridership and Revenue Sensitivity Analyses) are the most likely to occur. These scenarios for 2020 include:

- Significantly greater congestion on the highways and at the airports than is included in this plan. The increased travel delays due to this congestion would make high-speed trains much more attractive to passengers.
- Higher airfares than the modest increases due to estimated inflation than used in this plan.
- Higher increase in overall intercity travel than used in this plan.
- Based on these scenarios, we believe the statewide high-speed train system could generate more than $1 billion in excess revenues per year, beginning in 2020 (not the $300 million estimated).

At this level of revenue generation, private sector funding to construct major elements of the system would be both practicable and advisable. Furthermore, we believe that a project of this magnitude and importance would attract federal funding, which we have not included in our full-funding scenario. Greater private sector funding, coupled with federal funding, would decrease greatly the amount Californians would need to invest, perhaps to only about one-third of the total project costs.

An Evolutionary Step for Transportation in California

With our own state's history and approach in mind, we explored how other nations that have high-speed train systems developed their approaches, pursued their programs, and built their systems.

Specifically, the French and German experiences are most instructive for California. When both nations began exploring high-speed trains as a transportation option, their populations were similar to what California is expected to experience in the coming decade. They pursued their programs at the same time that highways and airports expanded. And, they built their systems in order that their entire infrastructure would work better for their citizens.

The same should hold for California. High-speed trains, in our view, are a logical next step in California's transportation evolution. We do not envision high-speed trains replacing the need to expand highways and airports; we do expect that Californians will enjoy a more efficient and productive transportation infrastructure with the advent of high-speed trains.

The importance of the state's transportation infrastructure to the economic vitality of the state cannot be underestimated. Failure to manage congestion and provide efficient and effective higher-speed transportation alternatives could serve as a drag on the state's economic growth. By 2020, a one-percent decline in the state's economic output could equate to some $50 billion in lost activity.

A Project in Keeping with California's Standards

As we have deliberated on the information that is the basis of this business plan, we challenged staff and consultants to keep California's standards-and expectations-for economic growth, environmental preservation, safety, and quality of life paramount in their work. As important as the financial qualities of the project are, the benefits to the state's citizenry, economy, and environment are equally as important.

This project is in keeping with California's high standards. We have concluded that a high-speed train system is a good fit for what California is today and will become in the future. We have further concluded that California should defer any consideration of what kind of high-speed trains should be selected to carry passengers until at least completion of the program environmental impact report. When it becomes necessary to choose the type of high-speed trains, the state should initiate an open procurement process to ensure that the state's taxpayers, and ultimately the high-speed train passengers, benefit from the best system at the best price.

After two years of careful and thorough analysis, the Authority is pleased to state that building a high-speed network similar to the one described in this business plan is a smart investment for the people of California. The initial work necessary to proceed with this project should begin as soon as possible.

As you deliberate on the project, we urge you to consider California's past, present, and future, as we have done. Based on the best facts at our disposal, we have concluded that California's future contains a high-speed train system. We trust you will conclude the same.

Michael E. Tennenbaum, Chairman

Edward P. Graveline, Vice Chairman

Donna Lee Andrews

Dr. Ernest A. Bates

Jerry B. Epstein

John P. Fowler

William E. Leonard

T.J. Stapleton

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EXECUTIVE SUMMARY

A high-speed train system is the logical next step in the development of California's transportation infrastructure.

Based on the best data available, a high-speed train system will return twice as many benefits to the state's citizens as it costs. In 20 years, the system is projected to carry 32 million intercity passengers annually, transport another 10 million commuters, generate nearly $900 million in revenues, and return a surplus to the state of more than $300 million.

Moreover, research indicates nearly two-thirds of Californians already endorse building a high-speed train system and would be willing to pay for its construction.

Legislative Mandate

The California High-Speed Rail Authority was created by the state Legislature in 1996 to develop a plan for the construction, operation and financing of a statewide, intercity high-speed passenger rail system.*

The Authority consists of nine members — five appointed by the Governor, two by the Senate Rules Committee, and two by the Speaker of the Assembly.

The Plan

With the assistance of the nation's best consultants in engineering, ridership forecasting, transportation economics and financing — as well as engineers and manufacturers of high-speed train systems around the world — the Authority has developed a plan to make high-speed train travel a reality in California.

The plan describes a 700-mile-long high-speed train system capable of speeds in excess of 200 miles per hour on dedicated, fully-grade separated tracks with state-of-the-art safety, signaling and automated train control systems. The system would serve the major metropolitan centers of California in 2020.

To meet its legislative mandate, the Authority also describes a vision of how this system would operate. The analytical work for this plan represents the most comprehensive review of statewide intercity travel yet undertaken. When considered in conjunction with the 20-year plans of the state's municipal planning organizations, it provides a detailed picture of the state's future transportation needs.

* Chapter 796 of the Statutes of 1996; SB 1420 Kopp and Costa.

This business plan does not suggest that a high-speed train system should be built in a vacuum and at the exclusion of meeting other important transportation needs over the next two decades. Instead, the business plan offers a way to approach the intercity travel needs of nearly 50 million Californians, which will only succeed to the extent that the state's freeways, airports and conventional rail systems are also enhanced. The existing transportation infrastructure will be more efficient and productive with high-speed trains, which will rely on the freeway, highway, urban transit, and conventional rail networks for access.

Other agencies at the federal, state, and local levels are preparing plans and programs to improve the existing transportation infrastructure. The focus of this business plan is on how to implement a high-speed train system that will work with other improvements to meet the mobility needs of California in the new century.

An investment in a high-speed train system should also be viewed within the context of what the state and its subdivisions will raise and spend on transportation over the next 20 years. Assuming the current rates for fuel and sales taxes dedicated to transportation purposes, California will generate nearly $220 billion in the next two decades. And, based on current plans and programs, this amount would enable California to manage congestion so it will not worsen.

By comparison, the high-speed train system's $25 billion capital cost represents only a fraction of what will be spent in transportation, yet promises significant benefits for a much larger population.

Successfully developing a high-speed train system will also require adopting a different mind-set than that which has shaped the planning, building and operating of trains for over a half-century.

Rather than seeking to realize primarily social and political objectives that require substantial public subsidies to construct and operate, the mind-set that drives the development of the high-speed train system should focus on returning substantial financial, economic and environmental benefits for whatever public and private investments are made. Failure to apply this new mind-set will place the high-speed train system in jeopardy of needing greater public capital and requiring operating subsidies.

Options and Recommendations

After two years of careful and thorough analysis, the Authority is pleased to state that building a high-speed train system is a smart investment for the people of California.

Because of the high-growth rate and urbanization in various areas of the state, the environmental phase of the high-speed train network should begin immediately in order to preserve the necessary right-of-way for track and stations. Failure to do so will increase costs substantially and delay reaping the benefits.

While the Authority has sufficient information and analyses to conclude that a high-speed train system is a smart investment and should proceed, the next step in development should be carrying out a program environmental impact report (EIR). This phase is the logical and appropriate next step for the following reasons:

- The further engineering and environmental analyses that are part of the initial environmental phase of the project will define with greater specificity the high-speed train technology, corridors and station locations included in this plan.
- The official input of federal, state and local agencies about the project (which is required during this phase) will help further hone the capital costs of the project — even though we are assured by the best technical advisors in the world that the system can be built for the $25 billion estimate included in this plan. It is reasonable to anticipate that the federal government would become a financial partner in this project, reducing the capital needs to be borne by the California taxpayer.
- The financial plan will benefit from substantive discussions with the private sector about investing in the project. Potential investors will be most interested in how the ridership and revenue projections compare with those of other agencies and their assessment of the future. For example, the business plan assumes annual growth in intercity air and auto travel of 2.5% and 1.3%, respectively. The Federal Aviation Administration applies an annual growth rate of 3.5% for air travel, and the Federal Highway Administration applies an annual growth rate of 2.0% to highway travel. In addition, the business plan does not assume increases in airport congestion or airfare over the next 20 years over what they are today. Ridership and revenues would be substantially higher if growth rates in airfares and air and highway congestion approach or exceed those used by the above agencies. Higher revenues that result from more congestion or increased airfares would reduce the investment the people of California will need to make.

The Authority recommends that the Governor and the Legislature take the following actions to start the state toward a 21st century passenger train network worthy of California's needs, desires, and aspirations.

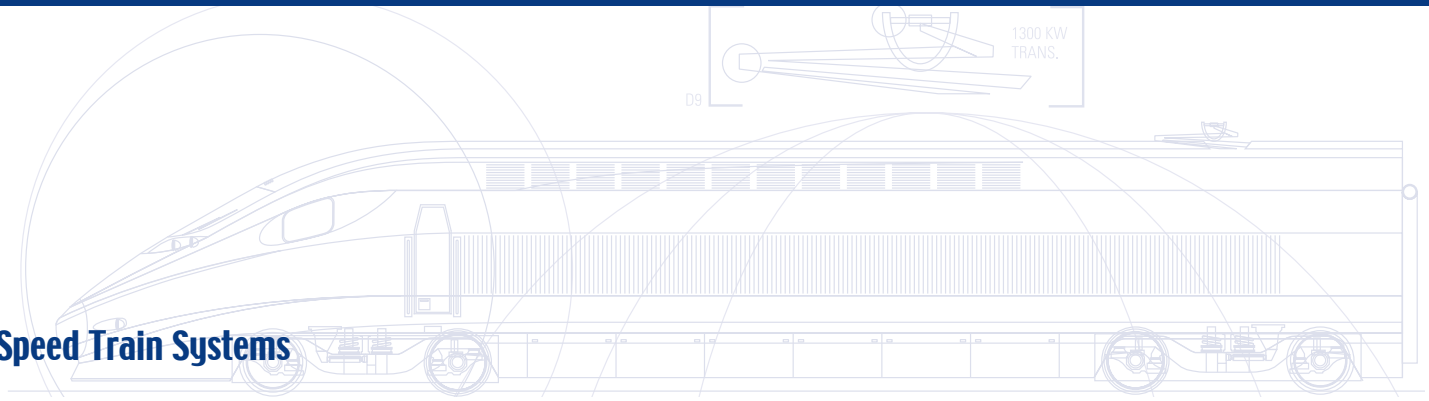
- Initiate a formal environmental clearance process with a state-level program environmental impact report (EIR)/federal-level Tier I environmental impact statement (EIS) on the high-speed train network described in this plan. At the conclusion of the program EIR/Tier I EIS, decision makers can re-evaluate funding options and strategies based on more detailed analyses and information. The financial commitment required to initiate this process is $25 million over the next two years. If the project is deemed viable at the conclusion of this phase, an additional $350 million would be required over the following three to four years to achieve full environmental clearance and achieve a 30 percent level of engineering design. The Authority, or its successor, would then have the option to entertain

proposals from the private sector to enter into a design-build contract and a franchise with the private sector to operate and maintain the system.

- Increase funding and accelerate planning and programming for intercity and commuter rail improvements that can provide enhanced, higher-speed service to Californians earlier and ultimately become part of the high-speed train network. These improvements should occur concurrent with the environmental studies and engineering work on the high-speed train network.
- Begin an aggressive statewide effort to increase federal funding for both conventional and high-speed trains in California. In addition, this effort should include working with the Federal Railroad Administration (FRA) and high-speed train manufacturers to resolve safety and compatibility issues.
- Encourage state, regional and local entities to include high-speed trains in their planning for the future.

In the following pages, the business plan summarizes the Authority's work on defining a high-speed train system, developing patronage and revenue forecasts, establishing the benefits of a high-speed train system, determining how it will integrate with other modes of travel, funding the project development and construction of the system, and gaining the input of Californians as to what they would like to see included in a high-speed train system.

1.0 WHAT IS A HIGH-SPEED TRAIN SYSTEM?



1.1 Existing High-Speed Train Systems

High-speed rail is a form of rail transport in which trains are electrically propelled at speeds exceeding 150 miles per hour. These trains currently operate in regular revenue service at maximum speeds of about 190 miles per hour, but have been tested at over 320 miles per hour. At high speeds, trains must be completely grade-separated, meaning there are no at-grade crossings with roads or other types of transportation; the tracks are fenced to prevent intrusion; and the trains must run on new, dedicated alignments that are very straight. High-speed trains also must have sophisticated, modern signaling and automated train control systems. High-speed trains are a safe, efficient, reliable and pleasurable way to travel between destinations that are generally between 100 to 500 miles apart. Utilizing a fraction of the energy per passenger of automobiles and jets, high-speed trains are the safest mode of travel, with no fatalities ever registered on new infrastructure designed for high speeds. Where they serve heavily traveled corridors, high-speed train passenger revenues generally exceed operational and maintenance costs.

Presently, two high-speed train technologies exist in the world: steel-wheel-on-steel-rail systems and magnetic levitation (Maglev) systems. The Japanese Shinkansen (or “bullet” train), the French TGV and the German ICE are all examples of steel-wheel-on-steel-rail systems. These are high-tech train systems that vastly improve upon traditional passenger rail technology. High-speed steel-wheel-on-steel-rail systems have been extensively proven in revenue service, carrying over five billion passengers to date.

High-Speed Trains in Japan and Asia

The Shinkansen was first introduced in revenue service in Japan in the mid-1960s with a 343-mile line connecting Tokyo and Osaka. Today, the Shinkansen network totals over 1,150 miles connecting Japan’s major metropolitan areas and carries over 300 million passengers every year. While operating hundreds of high-speed trains each day, the Japanese have a perfect safety record and near perfect on-time performance with an average deviation from schedule of only 24 seconds. Other Asian nations are now pursuing high-speed systems of their own. A new high-speed rail system is under construction in Korea and another is set to begin construction in Taiwan.

High-Speed Trains in Europe

High-speed train service began in France in 1981 and in Germany in 1991, although planning for the lines began in the late 1960s and early 1970s. In Europe, high-speed trains operate not only over specially engineered high-speed lines, but also at reduced speeds over improved “conventional” rail lines used by other rail services as well. Thus, the reach of the high-speed service is far greater than

the length of the new high-speed lines. In France, the TGV network began with the construction of a 186-mile high-speed segment that served an improved rail network of 550 miles. Today, the TGV network consists of over 800 miles of new interconnected high-speed lines and operates on a total network of nearly 3,500 miles of improved rail carrying over 45 million passengers every year. High-speed trains now operate through and connect England, France, Belgium, Germany, Italy and Spain. Ultimately, there will be a fully integrated high-speed train network throughout Europe.

Magnetic Levitation Systems (Maglev)

Maglev systems are a completely new technology that departs from the wheel-rail system by using either attractive or repulsive magnetic forces to lift and propel the vehicles along a guideway. Because Maglev trains hover above a guideway, these systems create no friction or rolling resistance and are expected to travel at even higher speeds than steel-wheel-on-steel-rail systems. There are no high-speed Maglev systems operating in revenue service anywhere in the world. However, both Germany and Japan have been developing and testing Maglev prototypes on test facilities for many years and are planning revenue producing Maglev systems that could begin construction later in this decade.

Higher Speed Train Service in the United States

In the United States, Amtrak's Metroliner service between New York City and Washington, D.C., is the only rail service that approaches high-speed standards. Currently, the Metroliner trains make the 226-mile trip in less than three hours traveling at speeds of up to 125 mph. A large improvement project to electrify and upgrade service from New York City to Boston is nearly complete. Newly developed trains capable of traveling up to 150 mph and fully compatible with the existing services will begin operating between Boston and Washington, D.C. this year. Amtrak expects the new trains, called Acela, to greatly increase the profitability of the service.

High-speed trains have operated in Europe and Japan for decades.

1.2 High-Speed Trains for California

The decision to choose a particular type of high-speed technology for California should be deferred until after the environmental clearance phase of this project. Manufacturers of steel-wheel-on-steel-rail and Maglev technologies should be able to compete for the opportunity to use their technology in California, ensuring the best product for the best price.

Regardless of technology, high-speed trains will offer Californians a new way of traveling. Combining the benefits of moving from one part of the state to another quickly with the freedom to plug in your computer or talk on a cell phone or get up to get a cup of coffee, high-speed train travel promises Californians a relaxing, productive trip. Tables would be available for group seating, with conference rooms available for business meetings en route. Because they travel over new dedicated infrastructure, trains traveling at high speeds provide an extremely safe, smooth and comfortable ride — seat belts are never needed. And high-speed trains are the most reliable way to travel, not hampered by rain, fog or interstate freeway delays in completing their scheduled runs.

Design Standards for California

In this business plan, high-speed trains are defined as those capable of exceeding 200 miles per hour. However, these trains will not operate at those speeds everywhere in the state. Within the state's urban regions, high-speed trains will likely only travel at maximum speeds between 100 and 150 miles per hour. For purposes of this business plan, all other trains — equipment, service, and trackage — will be known as "conventional rail."

The high-speed infrastructure will be a state-of-the-art, proven, world-class technology that significantly increases the state's transportation capacity. The system will use electric propulsion on a double track or guideway to provide the necessary high capacity, flexibility, and reliability. The system will be completely grade separated, with no potential for conflict with pedestrian or vehicular traffic. In addition, the high-speed train right-of-way will be completely fenced and monitored to avoid intrusion by pedestrians, wildlife or livestock. Using modern signaling technology, trains on similar infrastructure in Asia and Europe can operate at three-minute intervals.

Combining the benefits of moving from one part of the state to another quickly with the freedom to plug in your computer or talk on a cell phone or get up to get a cup of coffee, high-speed train travel promises Californians a relaxing, productive trip.

In general, the high-speed train system will be built at-grade and require a corridor 50 feet wide *(see Figure 1.1)*. In severely constrained urban areas, where grade separation costs are prohibitive, aerial structures *(Figure 1.2)* or retained fill are assumed. By comparison, a 12-lane freeway constructed to Caltrans' standards requires a nearly 225-foot-wide right-of-way.

All intermediate stations will feature siding tracks to allow express trains to pass through without slowing down. High-level boarding platforms will facilitate passenger loading and unloading as well as meet requirements for disabled passengers under the Americans with Disabilities Act. Each station will be a transportation hub connecting the high-speed train system to highways, conventional rail, transit, and/or air transportation networks, as appropriate.

The ridership and revenue estimates in this plan have assumed 10-car trains capable of seating 650 passengers, and that by 2020, the system will need to operate trains about every 15 minutes during peak periods. To put the total available capacity of this system into perspective, consider that the signaling system would permit trains to run every three minutes, and additional passenger cars could be added to the trainsets. Two trainsets could even be linked — effectively doubling their capacity. Trains carrying 650 passengers every three minutes in both directions could serve up to 26,000 passengers per hour — equivalent to the number of passengers currently moved on a 12-lane urban freeway during peak periods. The Authority's projections suggest that even by 2050, the high-speed system would be carrying less than 50 percent of its ultimate potential capacity. The high-speed train infrastructure would provide capacity to serve California's growing transportation and mobility needs to move intercity passengers, commuters, and goods throughout the 22nd century.

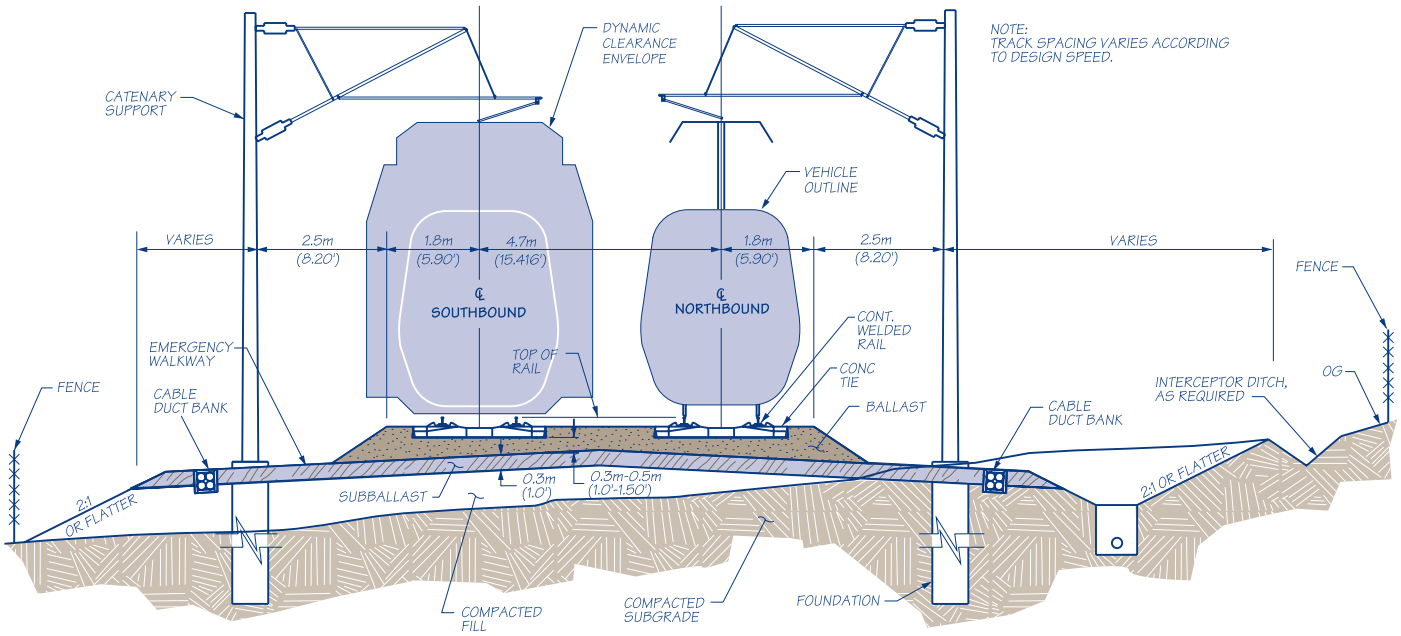


Figure 1.1
At-Grade Ballasted Trackway

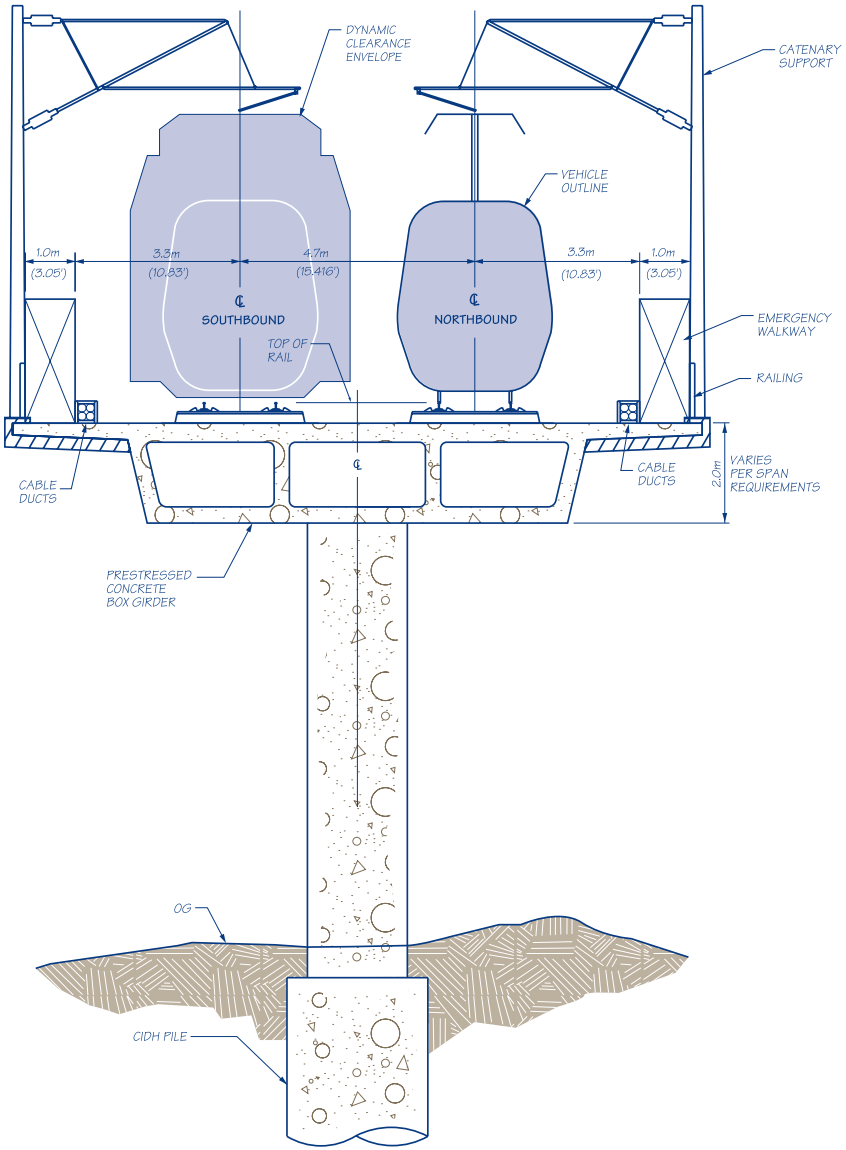


Figure 1.2
Aerial Trackway

Compatibility with Other Rail Services

The Authority has assumed that the dual track or guideway is dedicated exclusively to high-speed and compatible rail services. Presently, high-speed trains capable of speeds exceeding 200 miles per hour cannot share track or guideway with conventional rail operations, including the current generation of passenger equipment operated by Amtrak and regional rail authorities, as well as the freight equipment currently operated by the freight railroads. Where high-speed and conventional rail operations must share a right-of-way, the incompatible services must be separated horizontally or vertically. The high-speed tracks or guideway will be protected by an intrusion detection system and, in some areas, separated from conventional rail operations by a crash barrier or by placing the high-speed trains on an aerial structure.

Federal Railroad Administration (FRA) rules do not allow for mixed operations of high-speed and conventional rail equipment, primarily because the two classes of equipment are designed to withstand different impact loads in the event of a collision. Because conventional rail equipment is much heavier and impact-resistant, the possibility of collision with a lighter high-speed trainset poses a potential safety hazard. The FRA may eventually adopt rules consistent with European practice that rely on collision avoidance rather than traffic separation. It is also possible that a high-speed trainset meeting both crashworthiness and high-speed performance specifications will be available during the implementation time frame of this project.

2.0 BUILDING A HIGH-SPEED TRAIN NETWORK

2.1 Route and Alignment

The Authority continued with the work of the High-Speed Rail Commission to evaluate alternative routes for a high-speed train system that will meet the travel demands of California residents for the year 2020 and beyond. The objective was to serve all major population centers projected to exist in 2020 and high-speed travel markets anticipated for that time period.

In preparing a sound financial plan, it is necessary to select a complete system that meets the basic objective of serving the 2020 and beyond travel markets effectively and efficiently, while maximizing user revenues and minimizing public (non-user) contributions.

Cost estimates were based on five percent engineering analysis at a conceptual planning level. Investment quality travel demand, ridership and revenue estimates were made. Based on the results of these analyses and current available data, the Authority selected the alignment represented in *Figure 2.1* as the "highest projected return on investment route" to be used in preparation of the full-funding scenario presented in Chapter 6.

This "optimum" system represents the best investment opportunities based on currently available information, but does have shortcomings and uncertainties that require further investigation. It does not provide service to Orange County in the south nor to the East Bay Area in the north. It does not serve Los Angeles International Airport (LAX), the state's largest airport, or Palmdale, a potential regional airport, and it may adversely impact agricultural land in the Central Valley area.

In order to further optimize the alignments, to address potential shortcomings, and to develop a more accurate cost figure based on a more refined level of engineering, the Authority recommends several additional corridors be investigated in the next phase of work, which is the environmental clearance process. Final alignments should not be selected at least until the conclusion of a state program level Environmental Impact Report (EIR) and/or federal Tier I Environmental Impact Statement (EIS). Based on work conducted thus far, the Authority is confident that should any one of the alternative corridors be selected, a high-speed train system can be constructed and financed within the limits of the full funding scenario. It is also possible that as demand for service grows, some alternative routes may become viable segments to be constructed. By completing the program EIR on these routes, the option of building more than one route will be available. *Figure 2.2* represents the corridors that should be included in the environmental assessment based on data available at this time. A final

Figure 2.1
Highest Return on Investment Route

Figure 2.2
Recommended Routes to be Studied in the Environmental Clearance Phase

decision on alignment prior to the completion of additional studies would not be prudent.

The station locations described in this section were identified as the most likely sites based on current knowledge and are consistent with the objective to serve the major population centers of the state in 2020. There is, of course, a critical tradeoff between the accessibility of the system to potential passengers and the resulting high-speed train travel times. The station locations shown here are spaced approximately 50 miles apart in rural areas and 15 miles apart in the metropolitan areas. Additional or more closely spaced stations would negatively impact travel times and the ability to operate both express and local services.

Several key factors were considered in identifying potential station stops. These include speed, cost, local access times, potential connections with other modes of transportation, and the distribution of population and major destinations along the route. Again, the ultimate locations and configurations of stations cannot be determined until the conclusion of the environmental clearance process.

A description of each segment of the high-speed network is provided below:

Los Angeles — San Diego

High-speed train service for major population centers, including Los Angeles, Orange and San Diego counties and the Inland Empire is essential and must be included in the high-speed train system. Two viable and potentially inclusive routes can meet the need. Both routes would start from Los Angeles Union Station and terminate in San Diego and would provide direct service from north of Union Station to San Diego without requiring a transfer at Union Station.

The station locations are spaced approximately 50 miles apart in rural areas and 15 miles apart in metropolitan areas.

One option would include a coastal alignment that modifies the existing LOSSAN rail route. This option would include stations at Norwalk, Anaheim, Irvine, University Town Center and downtown San Diego. The other option is on an alignment going east from Union Station to the Inland Empire using existing rail rights-of-way with stations at East San Gabriel Valley, Ontario Airport, and Riverside. This Inland Empire option would continue south from Riverside using the Interstate 215/Interstate 15 highway corridor to San Diego with stations at Temecula and Mira Mesa, and would terminate in San Diego near Qualcomm Stadium. Both options produce similar ridership and revenues, but the coastal alignment is estimated to cost less to construct.

The coastal option, while promising to be less costly and therefore a better capital investment, requires major modifications to the existing right-of-way as well as approval from the cities and communities along the route. The Federal Railroad Administration (FRA) will need to grant an exemption to allow the high-speed line to share track with other trains in the corridor. Given the potential of this corridor, the coastal option should continue to be evaluated in the environmental process, along with the second option, which has been selected for the funding scenario.

Given the importance of service to communities along the coast, the Authority recommends that the environmental studies along the LOSSAN Corridor also consider improvements to achieve the highest possible speed and capacity improvements consistent with environmental constraints and community support. Highest priority should be given to improvements between Los Angeles Union Station and Anaheim. If high-speed service on this corridor is not feasible, conventional rail should be improved to increase speed and capacity to provide the highest level of service possible. The Authority would work with Amtrak to make the LOSSAN Corridor a high-speed Amtrak corridor and to secure federal funding for the necessary improvements.

The state has received a Federal Railroad Administration (FRA) planning grant to conduct the necessary engineering and environmental work to compete for a potential federal construction grant for a Maglev line serving Los Angeles International Airport (LAX), Union Station, Ontario Airport, and March Airport in Riverside. This project is a joint effort of the Business, Transportation and Housing Agency, the Southern California Association of Governments, and the Authority. Should this project prove feasible and move forward toward construction, it would satisfy the need for service to LAX as well as the Inland Empire. Depending on the type of technology selected for the rest of the network, travelers to and from other regions may need to transfer from one train to another at Union Station to complete their journey. Therefore, the environmental studies for these corridors should be coordinated, with the objective of producing a single alignment and technology for this segment of the network.

Service to Los Angeles International Airport (LAX)

It is important that the state's largest airport, projected to have an annual passenger demand of nearly 100 million in 2010, have a direct and convenient link to the high-speed train system. This corridor is currently being studied as a potential Maglev corridor. Therefore, while this link is not included in the Authority's financial plan, service to this airport should continue to be investigated and evaluated for steel-wheel-on-steel-rail and Maglev technologies in the program EIR.

Tehachapi Crossing: Union Station — Bakersfield

From Union Station to Santa Clarita, the Metrolink right-of-way will be utilized with potential stations at Burbank Airport and Santa Clarita. North of this, one of the major challenges for a statewide high-speed train system is the connection from Santa Clarita to Bakersfield. Two viable options for this corridor exist. One follows Interstate 5 (I-5) over the Grapevine, which includes 28 miles of tunnels, and the other is a line through the Antelope Valley with a station at Palmdale. The Antelope Valley alignment, which crosses the Tehachapis through the Mojave Pass, will be 41 miles longer than the I-5 route option but includes only 11 miles of tunnels.

Engineering and planning analyses by the Authority, the High-Speed Rail Commission, and Caltrans show that both options are feasible. Based on the results of engineering and other analyses to date, the I-5 Corridor would cost $700 million less to construct and produce higher annual ridership with lower operating costs. Therefore, the Authority, using cost and ridership as its primary criteria, selected the I-5 route to be used for the funding scenario.

The Authority recognizes, however, that the I-5 route decision may change as a result of further technical studies and analyses performed during the environmental process, along with other factors, including, but not limited to, airport development, changes in

regional growth patterns, and cost sharing with local entities, developers or airports. Therefore, the Authority recommends that both corridors be evaluated equally through the environmental assessment phase and that final selection of a preferred alignment be made at the conclusion of that phase.

Central Valley: Bakersfield — Merced

Among the four corridors evaluated by the Authority, the West of State Route 99 alignment, which was recommended by the High-Speed Rail Commission, has the lowest cost and fastest travel times, and yields higher ridership and revenue. Using cost and ridership as the primary criteria, the Authority selected this corridor with stations at Bakersfield, Visalia, Fresno and Merced to be used for the funding scenario.

This corridor could have a greater impact on prime agricultural land, however, and it does not easily serve either downtown Fresno or downtown Bakersfield, which are those cities' preferred station location sites. The Authority therefore recommends that the environmental assessment also consider the following refinements to this alignment:

- Options to minimize the impacts to prime agricultural lands;
- Options to serve a downtown station or airport in Fresno;
- Options to serve a station close to the county seat and government center or airport in Bakersfield; and
- Options to utilize existing rail corridors.

Recognizing that the success of a high-speed system is highly dependent on travel time, the objectives of any refinements to this corridor should be: 1) to negotiate with right-of-way owners and local officials to select an alignment that can maximize the use of existing transportation corridors; and, 2) to meet the needs of local and regional entities without incurring unnecessary costs to the state or increasing express service travel time. In order for the stations to be located downtown, the Authority and city officials must jointly agree on station location, parking, traffic, circulation and revenue and cost sharing.

Bay Area Access

The optimum corridor for serving the San Francisco Bay Area is an alignment from south of Merced through the Pacheco Pass, in the vicinity of State Route 152. This alignment would head west from the State Route 99 corridor north of Fresno. From Gilroy to San Jose, the alignment would utilize the existing Caltrain rail corridor. Potential station sites include Los Banos, Gilroy, and San Jose.

San Jose — San Francisco — Oakland

Direct service from San Jose to Fourth and Townsend streets in San Francisco along the San Francisco Peninsula produces higher ridership and revenue than an alternative from San Jose to Oakland. The Peninsula alignment utilizes the Caltrain right-of-way and would also permit a direct connection to the region's hub airport at SFO. Therefore, this alignment, with stations at Redwood City and SFO, has been selected for the funding scenario.

Service to the East Bay is, and will be, an important component of a successful intercity passenger train network. Therefore, the Authority recommends that both the San Jose — Oakland segment and the San Jose — San Francisco segment be included in the environmental assessment phase and that the final decision on how to serve these key regional cities be made at the conclusion of that work. In addition to the environmental studies for a high-speed corridor, options for increasing speed, frequency and reliability of conventional rail in the Capitol Corridor, particularly San Jose to Oakland, should be evaluated.

Termination at the Transbay Terminal in San Francisco should also be included in the environmental studies. This option would be subject to the Transbay Terminal being designated as a regional bus and transit hub, the Authority and the City and County of San Francisco reaching agreement on the construction and use of the terminal, and the Authority and the Caltrain Joint Powers Authority reaching agreement on shared use of right-of-way.

Central Valley: Merced — Sacramento

The optimum alignment for this segment would ollow the State Route 99 corridor to the downtown terminus in Sacramento. A new rail corridor would extend from Merced to a station in Modesto along the State Route 99 corridor, to the outskirts of

Sacramento. Existing rail right-of-way would be used through Sacramento to the downtown terminus. A station to the east of State Route 99 would serve Stockton.

2.2 Implementation Process and Construction Phasing

Neither construction of the system nor selection of a specific alignment can take place until completion of the environmental review process, as specified by California and federal law. Because of the complexity and geographic scale of the project, the implementation is expected to take 16 years from the start of the environmental review process to full operation *(Figure 2.3)*. Specific revenue-producing segments could, however, potentially be completed and opened for revenue service earlier in the implementation schedule. The overall implementation process for the high-speed train system can be divided into three phases, as described below.

Phase 1: Conceptual Planning

This phase was initiated by the California High-Speed Rail Commission, continued by the Authority, and will be complete with the submission and acceptance of this business plan.

Phase 2: Environmental Review and Preliminary Engineering

This next phase of implementation will include both a broad, program-level environmental review process as well as a project-specific environmental analysis. The next step toward implementation will be to prepare a program level EIR/EIS. The program level environmental process will address the cumulative impacts of the statewide high-speed rail program. The process will also focus on the environmental analysis of each of the corridor alternatives to identify alignments that are considered feasible by local, state, and federal agencies with approval or permit responsibilities. Alignment and station locations will be further refined, a detailed construction phasing plan prepared, and engineering design completed up to the 10 percent level during this process. Upon completion of the program level EIR/EIS, the Authority will have the ability to purchase or preserve some of the right-of-way for the system. The program level EIR/EIS is expected to take up to two years and $25 million ($1999) to complete.

Project-specific environmental reports and preliminary engineering will commence during the implementation phase following the program level EIR/EIS. This four-year period would involve project-specific environmental analyses and preliminary engineering for discrete segments of the system; preparation of procurement documents for construction, operations, and maintenance; and finalization of the construction staging plan. The engineering designs would be completed up to the 30 percent level at the end of this phase.

Phase 3: Final Design and Construction

Final design and construction will begin upon the completion of the environmental process and preliminary engineering of a discrete segment of the system. Assuming the use of a design-build procurement approach, construction of the system could be completed within 10 years. Specific revenue-producing segments could be completed and opened earlier in the implementation schedule. For example, a core segment from Los Angeles to San Francisco could potentially be completed at the end of the seventh year with completion of the remaining segments to follow.

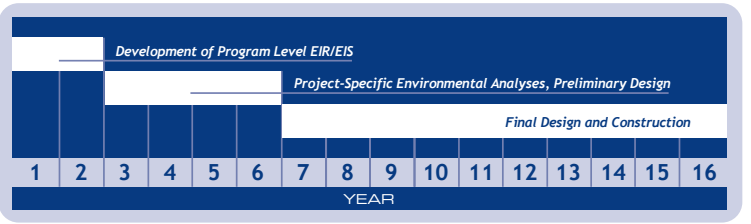


Figure 2.3
Implementation and Construction Timeline

2.3 Capital Costs

The construction cost estimates and travel times presented for the high-speed train system assume steel-wheel-on-steel-rail technology because Maglev systems have not been constructed or operated for regular revenue service. The technology assumed is the "next generation" anticipated to be available within the implementation time frame. These assumptions were made in order to identify reasonable and deliverable performance characteristics and costs. The design criteria and performance characteristics presented in this section do not imply a recommendation on technology. The actual selection of technology and equipment manufacturer will be made as part of the system procurement process.

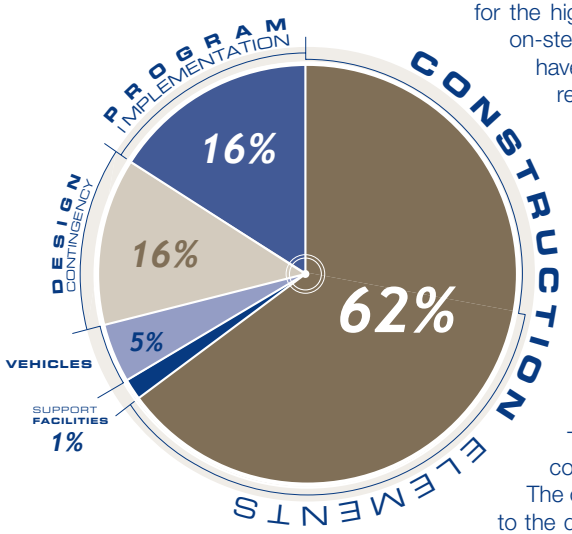


Figure 2.4
Capital Cost Breakdown

The high-speed train system is expected to cost $25 billion to construct in 1999 dollars. The cost per mile for the system varies according to the difficulty of the terrain and constraints on the right-of-way, varying from about $12 million per mile to over $70 million per mile in urbanized areas *(Table 2.1)*.

The total capital cost estimate includes all costs involved between the present time and the opening of the high-speed train system. These include construction costs, program implementation, vehicle costs, and support facilities. As shown in *Figure 2.4*, the bulk of the costs are in civil and construction work, to be done in California. Even portions of the trainsets that account for the remaining five percent of the total cost could be manufactured in California. Construction costs include stations, track work, earthwork, structures, grade separation, right-of-way acquisition, environmental impact mitigation, rail and utility location, signals and communications infrastructure, and electric power supply and distribution. As shown in *Figure 2.5*, structures account for over a quarter of the construction cost, with grade separation and right-of-way accounting for another 17 and 12 percent, respectively.

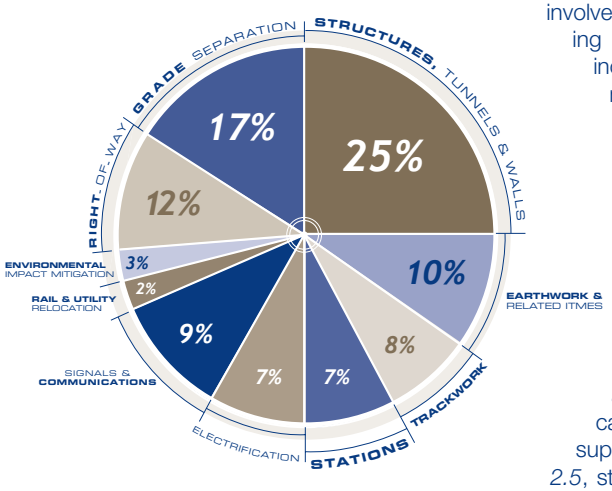


Figure 2.5
Construction Cost Breakdown

Some of the specific items of note in the cost estimate include fencing along the entire right-of-way and barriers where necessary for separation from incompatible rail traffic. The cost estimate also includes a contingency, calculated as 25 percent of the construction costs, as well as an allowance for environmental impact mitigation, calculated at 3 percent of the construction cost.

The Authority is confident that the capital cost estimates presented here will be sufficient to construct a high-speed train system. Many of the cost components involved, such as electrification, signaling, rail, and track bed are quantities well known from rail projects around the world. The costs for major civil works, including tunneling and structures, are specific to California's geology, seismic conditions, and labor markets. Previously completed civil projects in California, including freeway construction, major water projects, urban rail projects, and preliminary engineering work done for the Los Angeles to Bakersfield segment of the network (Caltrans, 1994), all provide guidance on these more specialized costs. Thus, capital costs can be estimated with a high degree of confidence even though the statewide engineering has proceeded only to the conceptual planning level.

SEGMENT	LENGTH (MILES)	CAPITAL COST (BILLIONS, $1999)	AVERAGE COST / MILE (MILLIONS, $1999)
San Diego - Riverside	92	4.1	44.5
Riverside - Los Angeles	59	2.7	45.7
Los Angeles - Bakersfield	110	4.4	40.0
Bakersfield - Merced	160	2.3	14.4
Merced - Sacramento	110	3.0	27.3
Merced - San Jose	129	4.5	34.8
San Jose - San Francisco	43	2.5	58.1
SUBTOTAL		$23.5	
Vehicles & Support Facilities		1.5	
TOTAL	703	$25.0	$37.8

Table 2.1
Capital Costs by Segment

2.4 Operating Scenario, Travel Times and Operating Costs

Service Plan

The conceptual operating plan takes advantage of the high-speed infrastructure's potential capacity and flexibility to offer a wide variety of service options. A mix of express, semi-express, local and regional trains would serve both intercity passengers and long-distance commuters.

In 2020, a total of 86 weekday trains in each direction will be needed to serve the statewide intercity travel market. Sixty-four of the trains will run between northern and southern California and the remaining 22 trains will serve shorter distance markets.

The basic service pattern provides most passenger service between 6:00 a.m. and 8:00 p.m., with a few trains starting or finishing trips beyond these hours. Five types of intercity trains are planned, including:

- Express (20 trains/day) — Trains running between Sacramento, San Jose or San Francisco and Los Angeles or San Diego without intermediate stops.
- Semi-Express (12 trains/day) — Trains running between Sacramento, San Jose or San Francisco and Los Angeles or San Diego with intermediate stops at major Central Valley cities such as Modesto, Fresno and Bakersfield.
- Suburban-Express (20 trains/day) — Trains running locally within the major metropolitan areas at the beginning and end of the trip (i.e., the San Francisco Bay Area and the Los Angeles area) without intermediate stops in the Central Valley.
- Local (12 trains/day) — Trains stopping at all stations. Some of these local trains might ultimately be operated as a "skip stop" service to improve the service and better match patterns of demand.
- Regional (22 trains/day) — Sacramento to San Francisco service and early morning service from the Central Valley to San Francisco or Los Angeles/San Diego.

Travel Times

The high-speed trains are projected to operate at speeds of up to about 220 mph *(Figure 2.6)*, making the travel times highly competitive with travel by air or auto. Travel between downtown San Francisco and downtown Los Angeles may be accomplished in just two-and-a-half hours. The trip between downtown Los Angeles and San Diego will take just an hour. *Table 2.2* shows additional samples of express travel times between cities.

The projected travel times account for alignment, train performance characteristics, acceleration and deceleration capabilities, and passenger comfort

Figure 2.6
Average Operating Speed on High-Speed Train System

TRAVEL TIMES (HOURS:MINUTES)	Los Angeles	San Francisco	San Jose	San Diego	Sacramento	Fresno	Bakersfield	Riverside
Los Angeles	-	2:30	2:02	1:00	2:09	1:19	0:47	0:29
San Francisco	2:30	-	0:31	3:29	1:40	1:15	1:47	2:58
San Jose	2:02	0:31	-	3:00	1:12	0:46	1:18	2:29
San Diego	1:00	3:29	3:00	-	3:07	2:17	1:46	0:34
Sacramento	2:09	1:40	1:12	3:07	-	0:53	1:25	2:36
Fresno	1:19	1:15	0:46	2:17	0:53	-	0:35	1:46
Bakersfield	0:47	1:47	1:18	1:46	1:25	0:35	-	1:15
Riverside	0:29	2:58	2:29	0:34	2:36	1:46	1:15	-

Table 2.2
Express Travel Times

criteria and have been verified by manufacturers of high-speed train equipment. The travel times include two minutes of dwell time at each station stop as well as a six percent schedule recovery time, consistent with European high-speed rail practice.

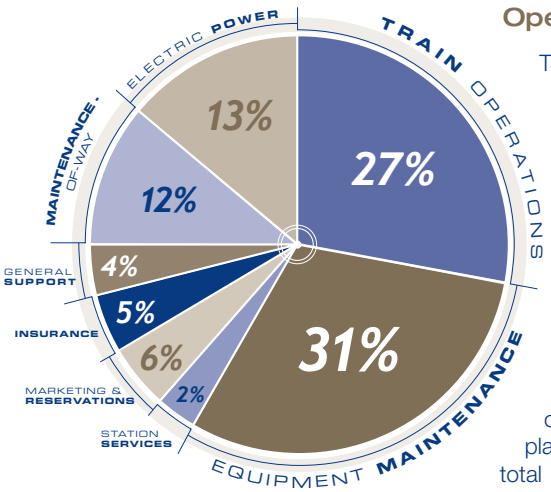


Figure 2.7
Operating and Maintenance Costs

Operating Costs

The operating and maintenance (O&M) performance of systems in Europe, Japan and the U.S. Northeast Corridor are well known. Since the trainsets and tracks would utilize European or Japanese technology, costs for maintaining tracks and structures (including power systems and signaling) were based upon foreign experience. To estimate operational and maintenance costs for California, many of the components, most notably labor costs, were based upon Amtrak's Northeast Corridor service. The annual O&M costs associated with the conceptual service plan and used as inputs to the funding scenario total approximately $550 million for 24.2 million train miles per year. The largest O&M components are train operations and equipment maintenance. Both of these are very labor intensive and depend highly on the number of trains and the operating schedule. Maintenance-of-way and replacement costs for infrastructure and trainsets are included in the O&M costs. The O&M costs also include a variety of long-term costs including advertising, reservations, station services and general support. Electric power consumption accounts for the remaining major component of O&M costs. In total, the O&M cost per train mile is $22.70 for intercity operations *(Figure 2.7)*.

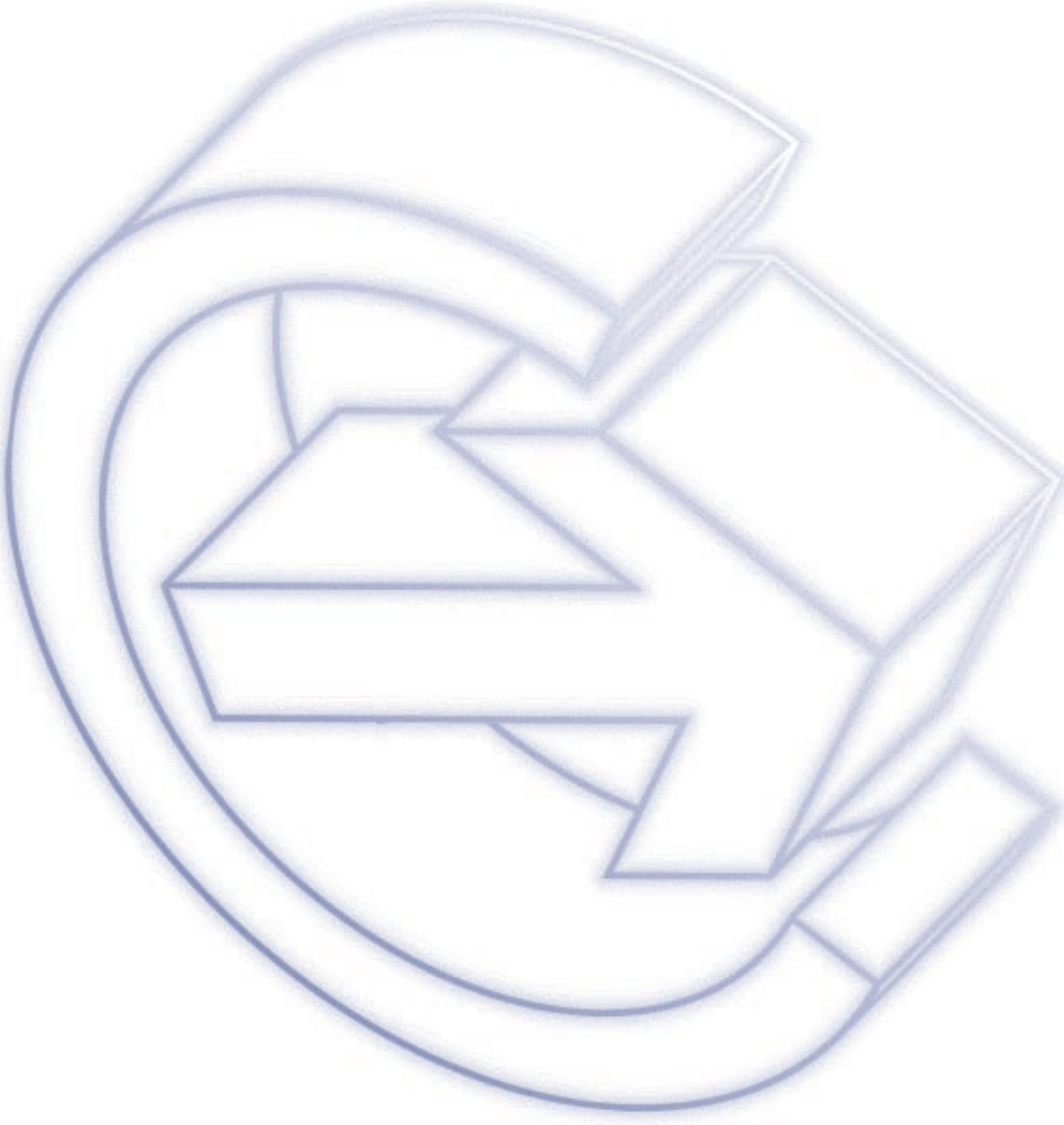
The high-speed train system would accommodate commute traffic in the San Francisco Bay Area (Los Banos — San Francisco), Los Angeles (Santa Clarita — Union Station and Temecula — Union Station), and San Diego (Temecula — Qualcomm) corridors with a relatively modest increase in operating costs. This is because long-distance commuters would ride the local and suburban express intercity trains already planned for operation in these corridors. The demand for high-speed, express commuter service could be accommodated with the addition of single passenger coaches on each train in most corridors. Only in the Los Angeles region would the level of demand require additional trainsets and additional runs. The incremental annual operating cost of serving commuters would be $31.8 million, by the year 2020. Revenues generated by the express commuters would, however, more than cover the incremental additional operating costs.

Potential for Freight Service

High-speed trains could be used to carry small packages, parcels, letters or any other freight that does not exceed typical passenger loads. This service could be provided either in specialized freight cars on passenger trains or on dedicated lightweight freight trains. In either case, the lightweight freight vehicles would have the same performance characteristics as the passenger equipment. This type of freight could be accommodated without adjustment to the passenger operational plan or modification to the passenger stations and therefore has been included in the funding scenario.

A high-speed freight service might also be provided on specialized, medium-weight freight trains. This specialized freight equipment would have limited axle loads (19 metric tons compared to the conventional freight standard of 27 metric tons per axle), would operate at speeds of up to 125 mph, and would be scheduled at night in order not to compromise passenger or maintenance operations. The medium-weight freight service would carry high-value or time-sensitive goods such as electronic equipment and perishable items. Although this service would not interfere with passenger operations, it would require loading and unloading facilities separate from the passenger stations. Additional pick-up and distribution networks for this type of freight may also be required. Therefore, while the Authority recognizes the potential for overnight medium-weight freight service on the high-speed tracks, it has not been included in terms of potential additional costs or benefits. Discussions with potential high-speed freight operators will need to be initiated as part of the program EIR/EIS.

The high-speed trains will operate at speeds of up to about 220 mph, making the travel times highly competitive with travel by air or auto.



3.1 Current and Future Intercity Travel Markets

The market for intercity travel in California that the high-speed train system can serve is projected to grow by almost 40 percent over the next 20 years, while the corresponding population increase is 36 percent. By the year 2020, the high-speed train system is forecast to carry 32 million intercity passengers and generate $888 million in revenue ($1999). This revenue will more than cover operating costs, resulting in an annual surplus of nearly $340 million. However, these estimates are based upon current costs, travel times and congestion levels of air and automobile transportation. Sensitivity analyses using assumptions of increased costs and congestion of air and automobile travel resulted in revenue from intercity high-speed train passengers up to nearly twice as high (over $1.7 billion for 2020). In addition, by 2020, the system is forecast to carry nearly 38,000 commuters every weekday or about 10 million commute passengers per year. Commuters traveling on intercity trains are expected to yield a modest additional revenue surplus and significantly increase the benefits of a high-speed train system.

The intercity patronage and revenue forecasts presented in this chapter are of investment quality and represent the best estimates possible at this stage of planning. The forecasts were developed using state-of-the-art techniques and rely on extensive survey market research conducted in California specifically for this purpose.

Current Intercity Travel

Californians currently make over 154 million annual trips between the major metropolitan regions of Northern and Southern California and regions in between. These are intercity trips made between regions as distinguished from regular commute trips to the place of work. Over 42 million of these trips are for journeys at least 150 miles long.

The automobile currently dominates intercity travel. In 1997, Californians took to the highways for over 88 percent of these intercity trips and flew for just over 10 percent of all trips. However, air is preferred for a greater proportion of longer intercity trips, serving well over a third of those trips longer than 150 miles. Only a relatively very small number of Californians made their intercity trips by existing conventional passenger rail.

Much of intercity travel in California is for trips of intermediate distance. These include over 54 million intercity trips made between the Central Valley and other major metropolitan areas, accounting for over a third of the intercity travel. Travel between the Los Angeles and San Diego regions forms the second largest geographic market with over 36 million trips. Travel between Sacramento and San Francisco represents the third largest intercity travel market in the state at over 21 million annual trips. Another key geographic market is that between the Los Angeles and San Francisco regions. This market coincides

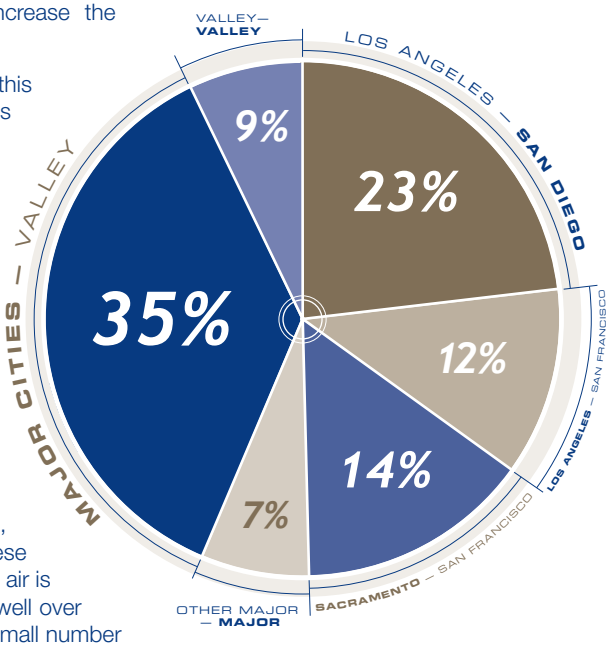


Figure 3.1
Current Intercity Travel by Geographic Market

with the busiest air route in the United States, if not the world. The 17.8 million trips between the Los Angeles and San Francisco regions represent 23 percent of all intercity trips *(Figure 3.1)*.

Intercity Travel in 2020

By the year 2020, the intercity travel market considered by this study will grow to almost 215 million trips. Almost 61 million of these trips will be at least 150 miles long. Without high-speed trains, almost 15 percent of all intercity travel and over 40 percent of the longer trips will be made by air. Auto trips will account for over 84 percent of all intercity travel and over 58 percent of the longer trips.

3.2 Intercity Patronage and Revenue Forecasts

The high-speed train network envisioned for California will provide a highly attractive option for intercity travel, and should result in robust ridership and a surplus in operating revenue. With 86 intercity trains per day in both directions, the high-speed train system is forecast to attract over 32 million intercity passengers and generate over $888 million by the year 2020.

Ridership and Revenue by Trip Purpose

About 38 percent of the high-speed train passengers are estimated to be traveling on business. These business travelers are forecast to account for a disproportionate share of the revenue (52 percent), reflecting the higher average fares paid. The remainder of the passengers, accounting for about 62 percent of the ridership and 48 percent of the revenue, are estimated to be traveling for non-business purposes *(Table 3.1)*.

	Ridership		Revenue	
	(MILLIONS)	(PERCENT)	(MILLIONS $1999)	(PERCENT)
Business	12.2	38%	$465	52%
Non-business	19.8	62%	$423	48%
TOTAL	32.0	100%	$888	100%

Table 3.1
Intercity High-Speed Train Ridership and Revenue by Trip Purpose for 2020

Ridership and Revenue by Geographic Market

Table 3.2 summarizes the system ridership and revenue by geographic market. These markets include trips between the Los Angeles and San Francisco metropolitan regions (e.g., San Jose to Santa Clarita), trips made between either Los Angeles or San Francisco and the Central Valley (e.g., Los Angeles to Bakersfield), trips made within the Central Valley (e.g., Fresno to Bakersfield), trips between other major metropolitan regions (e.g., Sacramento to Los Angeles), and other trips (e.g., Sacramento to San Diego). Trips between the San Francisco and Los Angeles regions are estimated to account for the largest portion of system ridership (35 percent) and revenue (39 percent). The next largest contributions to ridership and revenue are forecast to come from trips between the Los Angeles or San Francisco regions and the Central Valley (17 percent of ridership) and between the San Diego and Los Angeles regions (17 percent of ridership).

Most passengers are forecasted to board or disembark from the high-speed train system at one of the major metropolitan stations. With its numerous multi-modal connections, Los Angeles Union Station is estimated to be the busiest station, with 9 million total annual boardings and alightings followed by the San Francisco, Sacramento, and San Diego stations *(Figure 3.2)*. Total boardings and alightings equal twice the number of passenger trips, since each high-speed train trip requires a passenger to both board and alight.

Ridership and Revenue by Source

As shown in *Table 3.3*, most of the high-speed train riders will be diverted from air and the private auto. About 45 percent of the ridership will be diverted from air transportation and another 42 percent from the private auto. However, because airline passengers travel longer distances on average than auto travelers, have a greater tendency to be business travelers, value their time more highly, and pay higher fares than auto travelers, trips diverted from air will account for over half the system revenue.

The high-speed trains will also induce travel; that is, some people who would not otherwise make trips will now do so because of the availability of high-speed rail. These two million new passengers will account for about six percent of the ridership and five percent of the revenue.

	Ridership		Revenue	
	(MILLIONS)	(PERCENT)	(MILLIONS $1999)	(PERCENT)
L.A. Region - S.F. Bay Area	11.2	35	347	39
L.A. Region / S.F. Bay Area - Valley	5.3	16	125	14
Valley - Valley	0.8	2	18	2
Sacramento - L.A. Region	3.4	11	104	12
Sacramento - S.F. Bay Area	1.7	5	41	5
San Diego - L.A. Region	5.3	17	125	14
San Diego - S.F. Bay Area	2.3	7	74	8
Other	2.1	7	55	6
TOTAL	32.1	100	$889	100

Table 3.2
Intercity High-Speed Train Ridership and Revenue by Origin-Destination Regional Market Segment for 2020

	Ridership		Revenue	
	(MILLIONS)	(PERCENT)	(MILLIONS $1999)	(PERCENT)
Local Air	14.4	45	464	52
Connect Air	0.3	1	6	1
Conventional Rail	1.9	6	41	5
Private Vehicle	13.4	42	331	37
Subtotal	30.0	94	842	95
Induced Travel	2.0	6	46	5
TOTAL	32.0	100	$888	100

Table 3.3
Total Intercity High-Speed Train Ridership and Passenger Revenue in 2020 by Source

Mode Share with High-Speed Trains in 2020

High-speed trains will compete with existing modes of transportation, providing an attractive option for certain kinds of trips but not for others. In this regard, there are three categories of automobile trips:

- En route captive — these are auto trips that require stops to be made en route. Such trips are not considered candidates for diversion to high-speed trains.
- Destination captive — these are auto trips that require a private vehicle at the destination. The value of the perceived inconvenience and cost of renting a car at the destination is included when comparing high-speed trains to auto travel for this category of trips.
- Noncaptive — these are trips made by auto that neither require a vehicle at the destination nor stops en route. These trips are candidates for diversion to high-speed trains with no penalty associated with renting a car at the destination.

With respect to air travel, the high-speed train system will compete for two types of trips:

- Local air traffic — these are trips made by air within the state (between for example, Los Angeles and San Francisco, Burbank and Oakland, San Diego and Sacramento). All local air trips are considered candidates for diversion to high-speed trains.
- Connecting air traffic — these are cross-country or international trips made by air from San Francisco International Airport (SFO), the only hub airport assumed to have a direct high-speed train connection in these ridership forecasts. Connecting air trips originate from or have a final destination in areas outside the immediate vicinity of the airport. Examples of connecting air traffic that could be served by high-speed trains would be portions of trips from Fresno to New York City and from

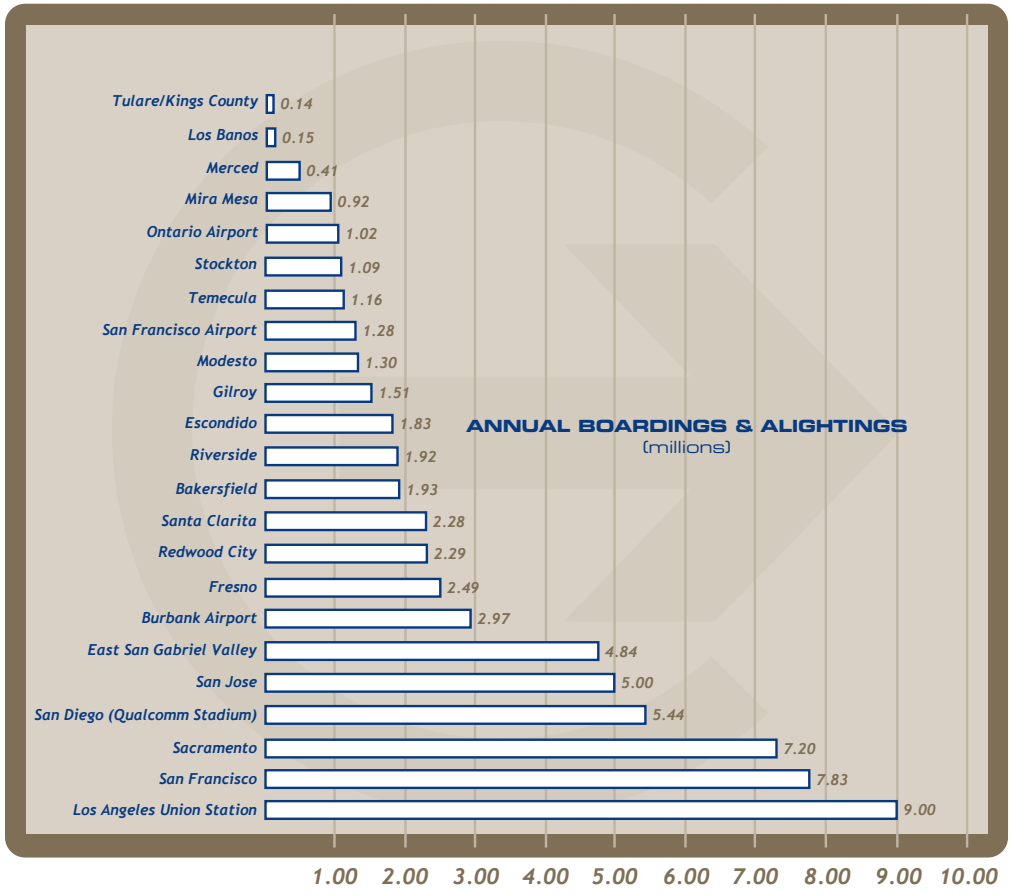


Figure 3.2
Total Boardings and Alightings by Station in 2020

Stockton to Tokyo via SFO, where travel to or from the airport is considered a candidate for diversion to high-speed trains.

Figure 3.3 shows the projected shares of total intercity travel by mode with high-speed trains. *Figure 3.4* presents the same information but only includes trips of at least 150 miles. The portion of intercity travel high-speed trains will capture varies by geographic market *(Figure 3.5)*. The private auto will continue to serve the majority of shorter distance trips, such as between the San Francisco and Sacramento regions. For the longest journeys, such as between Sacramento and San Diego, high-speed trains will split most of the market with air. In markets without frequent low-cost air service, such as between Fresno and San Francisco or Los Angeles, high-speed trains will play a key intercity transportation role alongside the private auto.

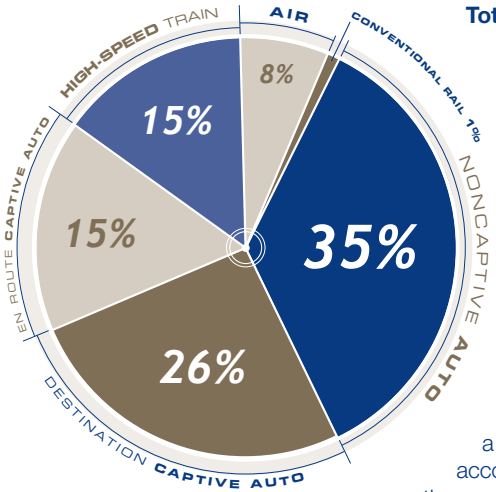
The availability of high-speed train service will divert over half of the trips within California that would have otherwise been made by air in the year 2020 *(Table 3.4)*. However, only seven percent of the previously existing auto trips will be diverted. Nonetheless, intercity trips diverted from auto travel will account for over 13 million high-speed train passengers and $331 million in revenue in the year 2020 *(Table 3.3)*.

High-Speed Train Service Characteristics

When selecting a means of travel, people consider a number of factors, including the fare, frequency of service, and door-to-door travel times as well as characteristics such as reliability, safety, and amenities. The following sections compare the proposed high-speed train service to other modes of transportation for some of these key service characteristics.

High-speed train service will divert over half of the trips within California that would have otherwise been made by air in the year 2020.

Figure 3.3
Intercity Travel Market Share with High-Speed Trains in 2020



Total Travel Time

Total travel time includes the time required to reach a station or airport; time spent waiting for the next scheduled flight or train (waiting time is a proxy for service frequency — less frequent service is reflected by more time waiting); time spent getting to the train tracks or airport gate; time spent checking in or retrieving baggage; time spent on the road, in the air, or on a train; and, the time needed to reach a final destination. Taking into account all these components of travel time and service frequency, high-speed trains will compare favorably to other modes. *Figure 3.6* illustrates typical total travel times for auto, air and high-speed trains.

The total travel times reported here reflect the conceptual high-speed train operating scenario[1]: a total of 86 trains per day in each of the northbound and southbound directions, with a mixture of express, suburban express, semi-express, local trains, and regional trains. Frequencies for air transportation were based upon current airline

[1] See Chapter 2 for full description.

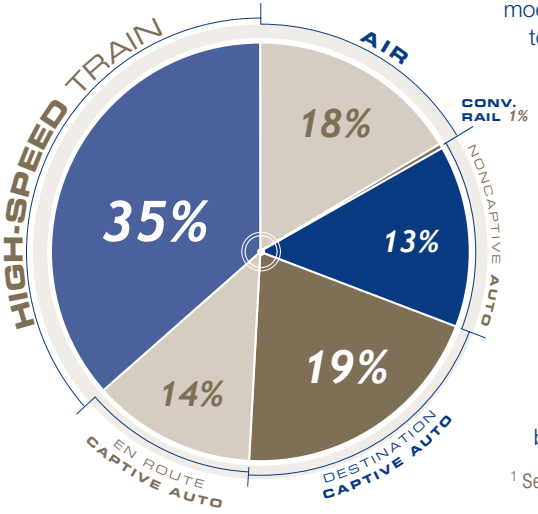


Figure 3.4
Intercity Travel Market Shares With High-Speed Trains in 2020 – Trips Over 150 Miles

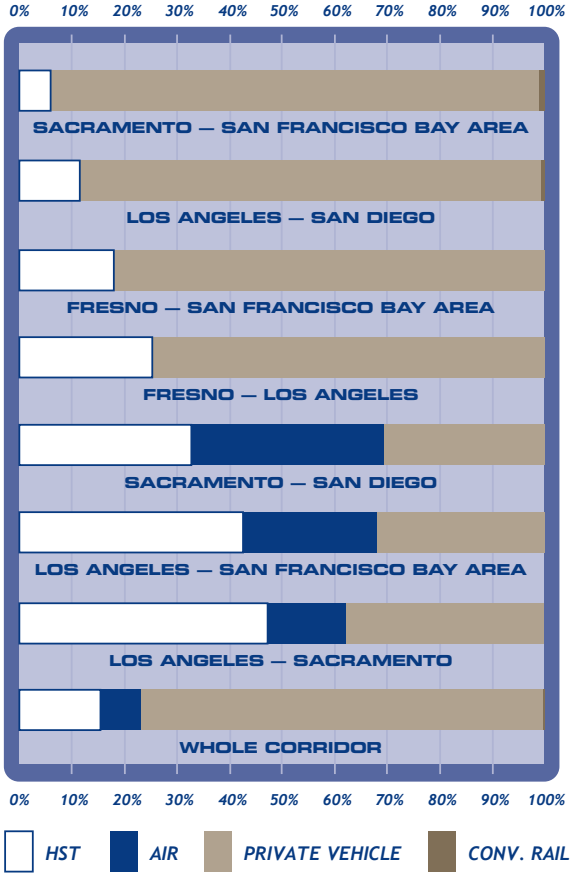


Figure 3.5
Mode Shares by Geographic Market for 2020 (percent of intercity trips between regions)

In regions without frequent low-cost air service, high-speed trains will play a key intercity transportation role alongside the private auto.

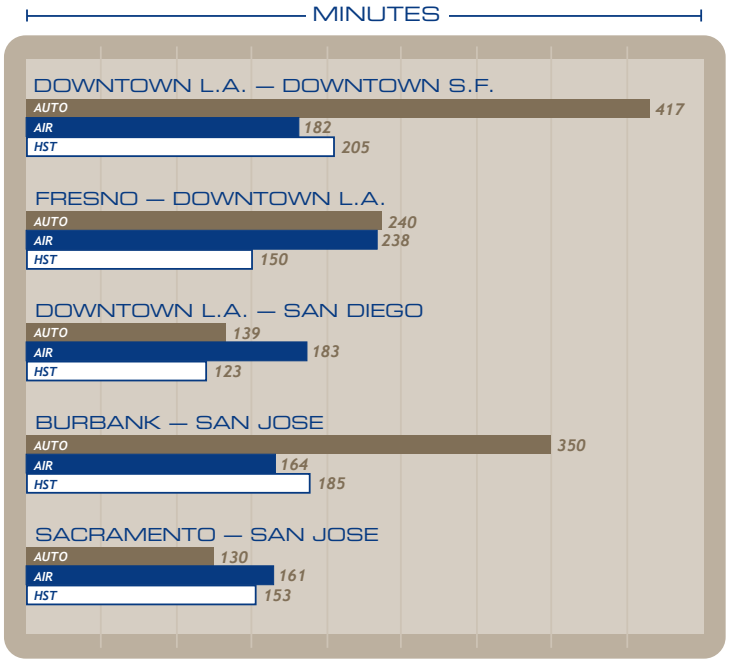


Figure 3.6
Sample Average Total Travel Times by Mode

schedules. Automobile travelers may use their vehicles at any time; therefore, there is no waiting time associated with automobile travel.

Fares

The high-speed train system will generate surplus revenue with fares significantly lower than current airfares. A number of alternative high-speed train fare structures were tested to evaluate the sensitivity of ridership and revenue to higher or lower fares. Alternative high-speed fare structures were characterized by comparing the high-speed train fare with the comparable airfare for travel between Los Angeles and San Francisco.

The revenue maximizing fare for the high-speed train system is between 70 and 80 percent of L.A.-S.F. airfare. With fares above 80 percent of the L.A.-S.F. airfare, high-speed train revenues slowly begin to decline, while high-speed train ridership declines at a much greater rate. For example, a fare policy based upon 110 percent of the L.A.-S.F. airfare, is estimated to produce only about 18 million annual intercity riders, while the revenue from passengers remains relatively constant — at nearly $900 million a year. With fares below 70 to 80 percent of the L.A.-S.F. airfare, high-speed train revenues also slowly decline.

MODE	Percent of Intercity Trips Diverted
Local Air	56
Connect Air	5
Conventional Rail	71
Private Vehicle	7
All Trips	14

Table 3.4
Percent Diversion by Mode to HST by 2020

However, the high-speed train ridership increases at a much greater rate. There is a tradeoff between system ridership and system revenue. That is, a lower fare produces more ridership, but less revenue.

The high-speed train fare structure selected for the funding scenario was set to maximize ridership (i.e., user benefits) while still maintaining a healthy operating surplus. Under the selected fare structure, high-speed train fares are about 50 percent of the comparable airfare for travel between San Francisco and Los Angeles. This means the high-speed train fare is much less proportionately than the comparable airfare in most other markets (e.g., Fresno to San Francisco). *Table 3.5* provides a sample of high-speed train fares assumed for intercity travel. These were calculated as the sum of a $20 boarding charge plus an additional fare per mile.

The survey market research conducted for this study showed that business air travelers paid fares about 27 percent greater than the average fare paid by all travelers, while non-business travelers paid fares that averaged only 71 percent of the overall average fare. The high-speed train fares were therefore adjusted accordingly, resulting in different high-speed train fares for business and non-business passengers. These fares were then combined with the estimated costs of traveling to and from the terminals (parking, taxi fares, etc.), to produce the total travel costs used in the ridership and revenue forecasting process. *Table 3.6* illustrates some sample total (door-to-door) costs for travel between different city pairs.

Quality of Service Characteristics

Service characteristics such as comfort, perceived safety, privacy, productivity and reliability also influence people's decisions about how to travel. The mode choice models used to produce these forecasts incorporate the influence of these service characteristics in addition to the more easily measured travel time, fare, and frequency characteristics. The travel survey data collected for this project show that when travel times and costs are equal, air and conventional rail passengers believe high-speed trains will be a significantly more attractive travel option in California than those existing modes.

High-Speed Train Ridership and Revenue Over Time

Ridership and revenue for the high-speed train system will continue to grow as the system matures and California's population continues to grow. By the year 2050, both ridership and revenue in constant 1999 dollars is forecast to increase by about half over 2020 levels to over 47 million passengers and $1.3 billion in fare revenue.

	Business / Non-Business		
	Air	High-Speed Trains	Auto
Downtown Los Angeles - Downtown San Francisco	$135/$81	$54/$32	$44/$22
Merced - Downtown San Francisco	$232/$132	$43/$26	$15/$7
Fresno - Downtown Los Angeles	$177/$102	$46/$28	$25/$13
Downtown Los Angeles - San Diego	$135/$79	$43/$26	$14/$7
Bakersfield - Sacramento	$189/$108	$42/$25	$32/$16
Burbank - San Jose	$86/$49	$48/$28	$37/$18
Sacramento - San Jose	$205/$124	$44/$26	$14/$7

* Notes: The sample costs include fares as well as parking, taxi fares and other costs involved in traveling to or from the station or airport. These costs reflect *averages*. The actual cost paid by any particular traveler will depend on the exact origin and destination of the trip. Also note that actual ridership calculations were made on a highly detailed basis, accounting for different travel times and costs in numerous geographic zones and then summarizing the results.

Table 3.6
Sample Total Trip Costs by Mode for Selected City Pairs ($1999)

Average Business Fare (ONE WAY)	Average Non-Business Fare (ONE WAY)	CITY PAIR
$42	$24	Downtown Los Angeles - Downtown San Francisco
$33	$18	Merced - Downtown San Francisco
$35	$20	Fresno - Downtown Los Angeles
$32	$18	Downtown Los Angeles - San Diego
$37	$21	Bakersfield - Sacramento
$40	$22	Burbank - San Jose
$35	$20	Sacramento - San Jose

Table 3.5
Sample High-Speed Train Fares ($1999)

With respect to revenue assumptions used in the financial plan, the experience of foreign high-speed rail systems shows that actual usage will be less than projected in the first years of service as people become aware of the new transportation system. The financial plan, therefore, assumes 85 percent of the projected ridership and revenue in the first year (2017), 95 percent in the second year (2018), and 100 percent in 2019 and beyond.

Potential for Long-Distance Commute Traffic

While the Authority's mandate is to serve the intercity travel market, the alignment of the system would also serve some important long-distance commute sheds in the San Francisco, Los Angeles, and San Diego regions, as shown on *Figure 3.7*. High-speed intercity trains would carry a portion of these longer-distance, interregional commuter passengers. Commuters make trips on a daily or near-daily basis.

The high-speed train system will generate surplus revenue with fares significantly lower than current airfares.

Figure 3.7
Express Commute Corridors

Because commuters choose their means of travel in a different manner than intercity travelers (e.g., commuters typically value their time less than intercity travelers), separate forecasts were made for commute traffic on the high-speed train system. The commuter forecasts where made using the regional travel demand models developed and maintained by agencies responsible for transportation planning in the San Francisco, Los Angeles, and San Diego regions.

Commuter Service and Fare Assumptions

Commuter service would be largely provided on the local and suburban express trains serving the intercity market, making stops at all high-speed train stations within and near each metropolitan area. Commuter service would be provided on four trains per hour at each station during the three-hour morning and afternoon peak periods. During off-peak periods, the commuter train frequency would be one train per hour. The fare structure assumed for commuter trips would be based on a $5.00 boarding charge plus 6.2 cents per mile. The resulting fares are somewhat higher than most commuter rail services now operating in California, reflecting the higher quality of service provided.

Forecasts of Commuter Patronage and Revenue

Table 3.7 shows the projected annual and daily ridership as well as annual revenue for commuter trips on the high-speed system for 2020. Commuter rail ridership is normally very downtown-oriented and sensitive to the ease and cost of automobile parking as well as highway congestion. The projected commuter ridership is not insignificant. With almost 10 million passengers, commuter ridership would be about 23 percent of the total ridership. Millions of commuters would be brought quickly and efficiently

Millions of commuters would be brought quickly and efficiently to the city-centers of San Francisco, San Jose, Los Angeles and San Diego each year by high-speed trains.

to the city-centers of San Francisco, San Jose, Los Angeles, and San Diego each year by high-speed trains. However, even though the ridership is impressive, commuter trips are much shorter than intercity trips and the revenue yielded per rider is lower than for intercity trips (about $6-11 versus $30-40 for intercity travel). Thus, the $70 million projected commuter revenue is less than eight percent of the total intercity passenger revenue.

Nonetheless, with the annual cost of serving commuter patrons estimated at $51 million[2], commuters using the high-speed train service would generate a modest operating surplus. Moreover, utilizing the high capacity of the system, the number of commuters riding high-speed trains would continue to grow throughout the 21st century. In contrast, the major highways serving California's largest city-centers are already at capacity during peak periods, and environmental constraints largely restrict future expansion of these facilities. Providing high-speed train service for commuters would utilize the high-speed infrastructure more efficiently and greatly improve mobility in highly congested commute corridors, increasing the public benefits of and broadening the base of support for the system.

REGION	RIDERSHIP		Annual Revenue (MILLIONS $1999)
	Daily (THOUSANDS)	Annual (MILLIONS)	
San Diego	0.9	0.2	$1
LAUS - Temecula	14.2	3.5	$28
LAUS - Santa Clarita	10.5	2.6	$17
San Francisco	11.9	3.3	$23
Total	37.5	9.6	$69

Table 3.7
Summary of Year 2020 Ridership and Revenue for Express Commuter Service

3.3 Sensitivity Analyses

The ridership and revenue forecasts used in the financial plan incorporate a number of assumptions regarding airfares, air and automobile travel times, and the projected growth in air and auto travel. To test the sensitivity of the forecasts to these variables, the Authority commissioned the following series of additional analyses using alternative assumptions:

Scenario 1: Increased Air and Auto Growth Rates. The investment quality forecasts used for the funding scenario assume annual growth rates for air and auto travel of 2.5 and 1.3 percent, respectively. These baseline growth rates resulted from econometric models developed and applied as part of the ridership forecasting process. These growth rates are lower than the rates used by some planning agencies and authorities. Therefore, sensitivity analyses were done to test the impact of higher rates of growth. A rate of 3.5 percent was applied for air transportation; a figure used in the past by the Federal Aviation Administration (FAA) for national aviation growth forecasts. An annual growth rate of 2.0 percent was used for auto, reflecting the rate used by the Federal Highway Administration as the long-term growth rate for all highway travel.

Scenario 2: Longer In-Flight Travel Times for Air. The financial plan ridership forecasts for 2020 assume that air travel times stay the same as today. However, increased delays at California's major hub airports are already noticeably getting worse. The Authority believes it is a likely prospect that by 2020, flight times within California will significantly increase. Therefore, under this sensitivity analysis, 15 minutes are added to each end of trips that would use the Los Angeles International (LAX), San Francisco International (SFO), or San Diego (SAN) airports. For example, a trip between LAX and SFO would take a half-hour longer, while a trip from LAX to Oakland airport would require an additional 15 minutes. These increased air travel times would make air transportation less attractive relative to other modes, including high-speed trains.

Scenario 3: Longer Auto Travel Times. The auto travel times used in the financial plan forecasts are taken from networks used by regional planning agencies throughout the state. Peak hour factors were applied to travel times within urban areas when analyzing business travel. However, highway congestion may be worse than expected if, for example, programmed improvements are not built or do not have the expected effect. The Authority believes that the highway travel times used to project high-speed train ridership, tend to be optimistic even considering today's highway congestion in California. For example, the average 2020 auto time between downtown Los Angeles and downtown San Diego is forecast to be two hours and 19 minutes, and two hours and 10 minutes between Sacramento and San Jose. Therefore, the Authority commissioned a

[2] This figure includes $31.9 million additional operating costs and $19.5 million in annualized capital costs.

Case	Annual Ridership (MILLIONS)	Annual Revenue (MILLIONS $1999)	% Change in Ridership	% Change in Revenue
Base forecast	32.0	888	N/A	N/A
1. Annual air/auto growth at 3.5%/2.0%	40.2	1,127	+26	+27
2. Air travel time +15 min at SAN, SFO, LAX	32.9	920	+3	+4
3. Auto travel time +30 min in LA, Bay Area	35.1	970	+10	+9
4. a) Air fares +50%	37.7	1,087	+18	+22
b) Air fares +100%	41.2	1,210	+29	+36
c) Air fares +150%	42.7	1,261	+33	+42
5. a) Combination of 2, 3 and 4a	41.5	1,196	+30	+35
b) Combination of 2, 3 and 4c	45.9	1,348	+43	+52
c) Combination of 1, 2, 3 and 4a	52.5	1,529	+64	+72
d) Combination of 1, 2, 3 and 4c	58.4	1,733	+83	+95

Table 3.8
Ridership and Revenue Sensitivity Analyses

sensitivity analysis to investigate the impacts of longer automobile travel times on high-speed train ridership and revenue. This scenario adds one-half hour to all auto trips to, from, or through the Los Angeles and Bay Area regions. For example, a trip between Los Angeles and San Francisco would require an additional hour, while a trip from Sacramento to San Diego would require just an additional half-hour. These increased auto travel times would make highway transportation less attractive relative to other modes, including high-speed trains.

Scenarios 4a, 4b, and 4c: Increased Airfares. The financial plan forecasts assume that airfares in California remain at recently observed levels. While airlines might engage in temporary price-cutting fare wars, airfares are at historically low levels. However, airfares may increase in response to higher demand, more costly fuel, or other factors. Airfares within California are among the lowest in the country and perhaps the world. As a frame of reference, air travelers within the Northeast Corridor (Boston — New York — Washington, D.C.) currently pay well over twice the fares that air travelers do between California's major metropolitan areas. Therefore, additional sensitivity analyses were done testing the impacts on high-speed train ridership and revenue if the cost of traveling by air transportation within California were to increase. Under these scenarios, airfares are assumed to increase across the board by a) 50 percent; b) 100 percent; and c) 150 percent from current levels. Such increased airfares would make air transportation less attractive relative to other modes, including high-speed trains.

Scenarios 5a, 5b, 5c, and 5d: Combination Scenarios. These scenarios are combinations of all of the above level of service changes for competing modes, combining the increased air and auto growth rates and/or travel times with increases in airfares.

As shown in *Table 3.8*, high-speed train ridership is most sensitive to increases in airfares and the assumed rates of growth for the intercity travel market. The higher airfares result in ridership forecasts of between 18 and 34 percent over the baseline used in the financial plan. Additional increases would result if increased airfares were combined with increased air and auto growth rates and travel times. By comparison, increased air or auto travel times alone would have a modest impact on high-speed train ridership. The sensitivity of revenue follows a similar pattern. However, because passengers diverted from air tend to pay higher fares, the high-speed train revenue increases more rapidly than ridership with higher airfares.

4.1 Benefit Cost Analysis: Benefits to High-Speed Train Passengers and the Traveling Public

Overview

The high-speed train system will be a statewide transportation project on the scale of the freeways and the state water projects. It will transform the way in which people travel between cities in California, offering travelers the choice of driving, flying, or using high-speed trains. The high-speed train system will benefit the state in a number of ways. Many of the benefits are quantifiable and can be estimated based on detailed ridership and revenue forecasts. For projects such as the high-speed train system that require public investment, if these benefits are greater than the total costs, then the project is said to be economically justified.

In the private sector, a project is said to be commercially feasible only if commercial revenue exceeds costs paid directly by the project developer. For projects requiring public investment, a more appropriate evaluation tool is benefit cost analysis, which compares the total benefits to the total costs of a project. Benefit cost analysis includes all benefits and costs accruing to the public at large as well as the project developer. If the total benefits exceed the total costs, the project is said to be economically justified or economically feasible.

This analysis includes only those benefits and costs which are quantifiable, monetizable, not duplicative, and not transferred from one group of society to another. More specifically, the benefits include:

- Intercity passenger revenue;
- Benefits to both intercity and commuter high-speed train passengers (net of fares paid);
- Reduction of airside delay for air passengers;
- Reduction in aircraft operating costs;
- Reduction of highway delay for both intercity and urban auto trips; and
- Reduction of accident costs and air pollution from intercity and urban auto trips.

Costs include all the construction, operation and maintenance costs for the intercity passenger service.

Through the year 2050, California will accrue over $44 billion in directly measured benefits from a high-speed train system — more than double the total costs using the "highest return on investment" high-speed train route used for the funding scenario *(Table 4.1)*. Not only high-speed train passengers will benefit from the system. In fact, most of the benefits will be enjoyed by air and auto travelers in the form of reduced delays, reduced air pollution, and reduced auto accidents and fatalities. The benefits will extend to interstate and even international travelers at California's major airports.

The computation of the benefits directly utilizes the ridership and revenue forecasts for the high-speed train service and is consistent with the Federal Railroad Administration's high-speed ground transportation commercial feasibility study[3]. Conservative assumptions were used throughout. The analysis is not exhaustive in its evaluation of benefits. For

[3] Federal Railroad Administration, "High-Speed Ground Transportation for America," September 1997.

Total Benefits	$44.2 (billions $1999)*
Total Costs	$21.5 (billions $1999)*
Net Present Value	$22.7 (billions $1999)*
Benefit/Cost Ratio	2.06

* Discounted at 4 percent

Note: Excludes benefits from development around stations, construction impacts, energy savings, potential freight revenues and potential savings from reduced conventional rail operations.

Table 4.1
Summary of Benefit Cost Analysis Results (through 2050)

example, no attempt was made to quantify the potential reductions in airport ground access congestion. In keeping with the policy of incorporating only "investment quality" numbers, surplus revenue from the express commuter service and high-speed freight service were not included in the analysis. Likewise, no potential operating cost savings or benefits to conventional rail passengers who take advantage of the high-speed train service were included in the analysis.

The estimated streams of benefits and costs occurring each year between FY 2001 and FY 2050 were discounted to their present value and summarized to calculate the benefit cost ratio *(see Table 4.2 and Figure 4.1)*. Benefits would begin with the opening of the system to riders on July 1, 2016 (the beginning of FY 2017), and continue through FY 2050, allowing 33 years of economic returns for the high-speed train project. This time frame is similar to the typical 35-year franchise payback period used for privately financed toll road projects.

The discount rate is a means of calculating a value now of benefits that occur in the future. The discount rate recognizes the time value of money. A four percent real discount rate was used in the calculations. However, the high-speed train project would be economically feasible even under the higher discount rates recommended by some public agencies and economists. An evaluation measure that is independent of any chosen discount rate is the Internal Rate of Return (IRR). The IRR is the real discount rate at which the net present value of a project is equal to zero. This measure can be thought of as the discount rate threshold at which the project is no longer economically feasible. The real IRR for the high-speed train project is 8.8 percent. Thus, the project remains economically feasible even at real discount rates well above four percent.

The following sections present additional detail on the calculation of each category of benefits.

Intercity Passenger Revenue

In a publicly financed project, passenger revenue reduces the costs that must be funded from other sources. However, in a benefit cost analysis, passenger revenues are counted as a benefit. The present value of the intercity passenger revenue totals over $9.6 billion, about 22 percent of the total benefit between 2017 and 2050 *(see Figure 4.2)*.

BENEFITS	(MILLIONS)
Passenger Revenue	$9,651
Benefits to High-Speed Train Passengers	
Intercity	$8,519
Urban	$317
Subtotal-Passenger Benefits	$8,836
Benefits to Air and Highway Travelers	
Intercity	
Airline Passenger Delay	$7,765
Aircraft Operating	$4,283
Highway Delay*	$3,540
Highway Accident Cost*	$780
Highway Air Pollution*	$103
Subtotal	$16,471
Urban**	
Highway Delay	$8,822
Highway Accident Cost	$326
Highway Air Pollution	$43
Subtotal	$9,191
Subtotal-Nonuser Benefits	$25,662
TOTAL BENEFITS	$44,149
COSTS	
Capital	($15,443)
Operating and Maintenance	($6,015)
Total Costs	($21,458)
Total (Net Present Value)	$22,690
Benefit/Cost Ratio	2.06
Internal Rate of Return	8.8%

*Outside the Los Angeles, San Francisco and San Diego metropolitan areas.
**Includes intercity highway non-user benefits within the three metropolitan areas.

Table 4.2
Results of Benefit Cost Analysis
(present value in $1999, discounted at four percent, through 2050)

Through the year 2050, California will accrue over $44 billion in directly measured benefits from a high-speed train system.

Benefits to High-Speed Train Passengers

Most intercity high-speed train passengers will value the benefits from traveling on these high-speed, comfortable, and safe trains more than the fares they paid to ride the system. This value, measured as the difference between the fares paid by passengers and the amount they would be willing to pay, is also known as consumer surplus. Benefits to induced travelers were not included as a conservative assumption.

The consumer surplus for intercity high-speed train passengers has a present value of $8.5 billion, or about $34 per intercity passenger in the year 2020. Notably, the consumer surplus is nearly as large as the passenger fare revenue. This result reflects a fare policy assumed by the Authority that maximizes public benefits while maintaining a healthy operating surplus.

In urban areas, commuters who use high-speed trains will save time over the previously available travel modes. The present value of the travel time savings for commuters is about $317 million.

Benefits to Intercity Air Passengers

Californians who continue to travel by air will also benefit from the high-speed train system. Over the next 20 years, at least three airports in California, including San Diego's Lindberg Field, Los Angeles International, and San Francisco International, are predicting "unacceptable" delays. By diverting some passengers to high-speed trains, the system will reduce the otherwise expected delays in major airports. These reductions in delay will, in turn, reduce aircraft operating costs. At California's nine largest airports[4], the present value of these benefits is estimated at over $12 billion.

There is considerable uncertainty with respect to airport expansion in California because of noise pollution and other environmental concerns. Nonetheless, the delay calculations assumed the planned capacity improvements and expansions listed in the airports' planning documents. Other conservative assumptions included a cap on total average airside delays of 15 minutes per aircraft, and an assumed shift of air passengers from congested airports to nearby airports with remaining capacity (i.e., passengers would shift from LAX to Burbank and from SFO to Oakland). The estimated benefits to air passengers do not include savings from potential reduced ground access congestion at these airports. In addition, based on the Federal Aviation Administration's growth rate forecasts, the average number of passengers per aircraft was assumed to increase by 50 percent from 1997 to 2016, and by 80 percent from 1997 to 2050.

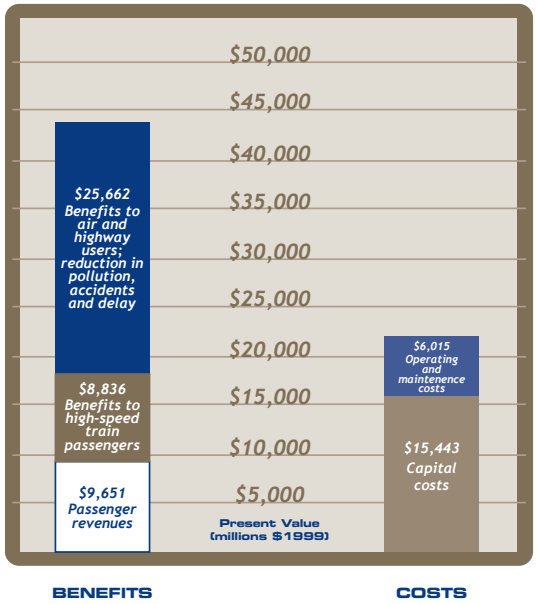


Figure 4.1
Quantified Benefits vs. Costs (Through 2050)

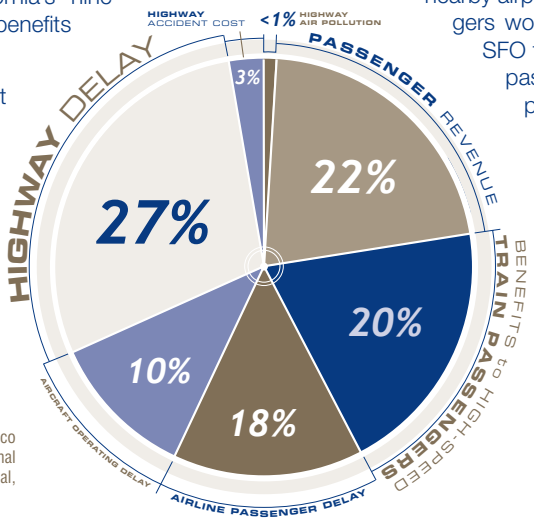


Figure 4.2
Breakdown of Present Value of High-Speed Train Benefits

[4]These include Burbank, Los Angeles International, San Francisco International, John Wayne (Orange County), San Diego International (Lindberg Field), San Jose International, Ontario International, Sacramento International, and Oakland International airports.

Highway-Related Benefits

Both intercity and urban highway users will benefit from reduced highway congestion as a result of trips diverted to high-speed trains. By making fewer intercity trips by auto than they otherwise would have, Californians will also benefit from reduced accidents and air pollution. These highway-related benefits have a present value of over $13.6 billion, with reduced highway delays being the most significant benefit.

Intercity Highway Benefits

Benefits to intercity auto travelers outside the Los Angeles, San Francisco Bay Area and San Diego metropolitan areas have a present value of over $4.4 billion with the present value of reduced highway delay outside the three major metropolitan areas over $3.5 billion and accident and pollution costs valued at over $883 million. These estimates of travel time savings or delay reduction for intercity travelers involved analysis of key intercity highway links in California, and took into account planned expansions of the highway network on State Route 99, Interstate 580, and Interstate 5, among other routes.

Urban Area Highway Benefits

Commuters and other highway users will obtain benefits from commuter and intercity highway users diverting to the high-speed trains in the Los Angeles, San Diego, and San Francisco Bay Area regions. The present value of these urban highway-related benefits is over $9 billion. The benefits from reduced urban auto travel in these regions was estimated using the travel demand models maintained by regional planning agencies.

4.2 Benefits Not Included in the Benefit Cost Analysis

This section discusses some of the additional benefits associated with the high-speed train system. The dollar values of most of the benefits described in this section should not be added to the results of the benefit cost analysis to avoid double counting. Instead, this discussion is intended to add a different perspective on the benefits provided by high-speed trains.

Development Around Stations

High-speed rail is a mode of transportation that can enhance and strengthen urban centers. In combination with appropriate local land use policies, the increased accessibility afforded by the high-speed service could encourage more intensive development and may lead to higher property values around stations. Although the financial plan does not assume that any of this revenue is available to help construct the system, local authorities may realize some of this gain in value through various value capture techniques such as benefit assessment districts or tax increment financing. Revenue in the range of $730,000 to $1.8 million per year at each potential station site might be realized through development.

Construction Impacts

The short-term impacts of constructing the system should not be ignored. While construction of the system will require a large capital investment, this investment translates into jobs and industrial output in California. System construction expenditures will produce the following types of effects:

- Direct Economic Effects — activity generated at firms directly receiving the construction spending;
- Indirect Economic Effects — activity generated by the successive rounds of off-site purchases from suppliers of materials and services; and
- Induced Economic Effects — activity generated as a consequence of additional worker income being re-spent on consumer purchases.

Both intercity and urban highway users will benefit from reduced highway congestion as a result of trips diverted to high-speed trains.

The direct, indirect, and induced economic impacts will occur in four basic forms:

- Industry output — the dollar value of industry's total production;
- Job-years — the number of jobs supported in each industry;
- Personal income —- all individual income generated as a result of increased industry output; and
- Taxes — all taxes generated as a result of added industry output.

Construction of the high-speed train system is estimated to generate the equivalent of almost 300,000 job-years of employment. In addition, the construction spending is estimated to generate in present value over $11 billion in personal income, almost $28 billion in industrial output, and $871 million in tax revenue. The industries in California that are expected to benefit most include construction ($10.4 billion in total added output), services ($6.6 billion in added output), and manufacturing ($2.7 billion in added output). Some portion of the labor and construction spending may, of course, occur outside of the state, but the bulk of the effect is expected to occur in California. Futhermore, the system will generate thousands of permanent jobs through the ongoing operations of high-speed trains.

Freight Revenue

The high-speed infrastructure offers great flexibility and potential in the type of services it can support. In addition to passenger traffic, the high-speed infrastructure could also be used to transport high-value/time-sensitive goods within the state. Preliminary analyses have shown that two types of freight service are possible. One type of service would involve transport of small packages and parcels on the passenger trains. The other type of service would involve running dedicated medium-weight, high-speed freight trains on the infrastructure during night hours. Although the ultimate specifications of any freight service are yet to be determined, the prospects for carrying freight on high-speed trains are very good. Accordingly, the financial plan includes a conservatively estimated $4.1 million in surplus freight revenue in 2017, ramping up to $34.1 million annual freight revenue by the year 2045. The freight revenue included in the financial plan comes only from small packages and parcels carried on the passenger trains. Freight revenue is a benefit not only in that it enhances the operating margins of the system but also in that the infrastructure would be used more intensively. In addition, there is value in having another option for carrying high-value/time-sensitive goods throughout the state.

Benefits Not Quantified

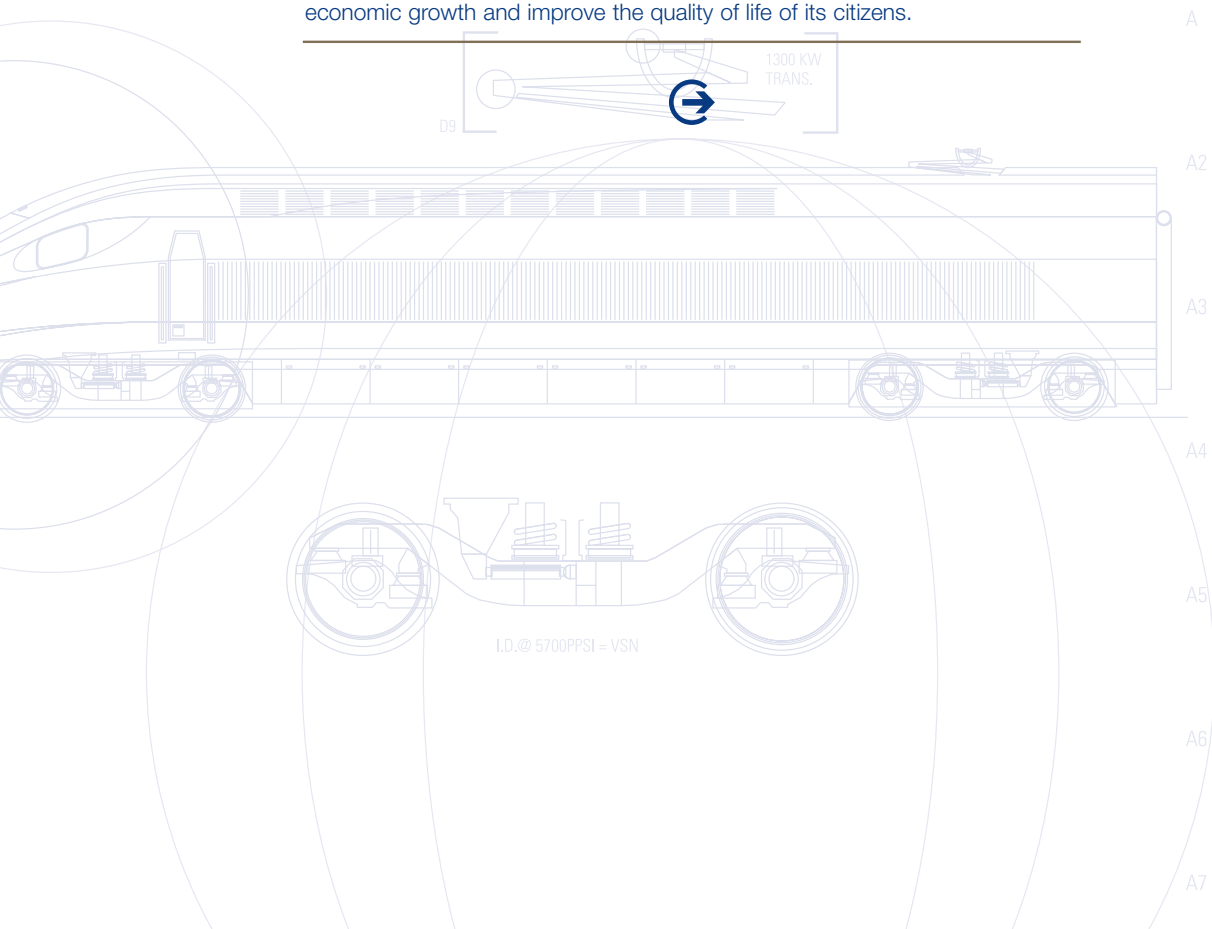
In addition to those benefits described above, the high-speed train system will bring other opportunities and benefits to the state that cannot be quantified. First and foremost, the high-speed infrastructure represents a major transportation capacity improvement that can be tapped by future generations in ways as yet unimagined. The economic vitality and stability of California has depended historically on the ability to move people, goods, and information freely and efficiently between population centers, agricultural markets, and ports of entry. This improvement to the statewide infrastructure will support commuter as well as intercity passenger traffic and high-speed freight service. High-speed trains will complement and connect to airports and highways, providing a substantially greater degree of mobility for those who travel in California.

Second, the high-speed train system will promote stability through diversity in California's transportation network. High-speed trains will provide a third option for intercity travel, giving Californians the choice of using airplanes, autos, or high-speed trains. The high-speed train system can reduce California's dependence on fossil fuels for intercity travel since it will use electric power traction. In the face of a natural disaster, high-speed trains would offer insurance against major disruptions to intercity travel, much as the BART system provided mobility after the 1989 Loma Prieta earthquake. For the Central Valley, a high-speed train system would eliminate much of the uncertainty and unreliability of both air and highway travel resulting from ground fog and other climatic conditions present at certain times.

Construction of the high-speed train is estimated to generate the equivalent of almost 300,000 job-years of employment.

Third, the high-speed train system can act as a catalyst to strengthen urban centers, promote more compact development around stations, and even increase local property values. The high-speed train system will provide a means to directly access urban centers, bypassing the congested roadways leading from airports and intercity highway corridors. It will also improve service to central city employment centers, and provide a valuable service to residents and groups with low auto availability (whether by choice or necessity). In concert with suitable local land use and economic development policies, high-speed trains can strengthen existing city centers by maintaining and improving accessibility.

Lastly, high-speed trains would enhance the quality of California as a place to live and do business. The advanced technology involved in constructing and operating the system — everything from the latest in signaling, communications, and controls systems to the most advanced structural engineering techniques — is consistent with California's leadership in high technology. Implementation of the high-speed train system would show that the state is committed to making the infrastructure investments necessary to sustain economic growth and improve the quality of life of its citizens.



5.0 A COMPREHENSIVE APPROACH TO INTERCITY RAIL

5.1 A Coordinated Effort

The Authority's legislative mandate is to develop a high-speed train system that is coordinated with the state's existing transportation network, particularly intercity rail and bus lines, commuter rail lines and urban rail transit lines.

This total approach to how a high-speed train system integrates with the state's existing transportation infrastructure underscores the tremendous potential high-speed trains have to not only meet the coming demand in high-speed travel but to enhance the overall efficiency of highways, freeways, airports, and conventional rail as well.

Such an approach is consistent with the way in which European nations (particularly France and Germany) and Asian countries (most notably Japan) have approached the development of their high-speed train systems.

The Authority's work has focused on how the high-speed train network and the existing network of conventional rail lines — both intercity and commuter — can be coordinated over the next 10 to 15 years. The synergies to be developed between high-speed trains and conventional rail will ensure that all of California's major population centers will be served and will build on the investments already made. Moreover, a coordinated, phased program to expand the conventional rail system can facilitate not only growth in commuter operations but to incorporate the expansion of freight rail operations in the state as well.

Unlike it has with the train system, the Authority has no statutory, policy, decision-making, or funding role with any other part of the state's transportation infrastructure. Its recommendations for coordinating the development of a high-speed train system with expansion of highway, freeway, airport, and rail networks are advisory only.

Figure 5.1
Conventional Rail Corridors Considered for Enhancements

5.2 Policies

In developing this facet of the business plan, the Authority adopted the policies listed below to guide its investigations and, ultimately, its recommended approach. These policies focus on an incremental, service-oriented approach to integrating the high-speed train system with existing rail and transit operations. The Authority also assumed that many conventional rail investments could be planned and constructed before the

high-speed train system is finished so that Californians could reap the benefits sooner.

- Improvements should be made to permit increased speeds on existing conventional passenger rail services.
- Service should use existing facilities or improved facilities in existing rights-of-way, with partial grade separation.
- Connectivity to all other transportation services should be maximized.
- Any improvements should not hinder the performance of the services provided by others using the tracks.

- Capital to improve infrastructure should be limited to corridors already receiving state funding for operations or corridors where high-speed service may not be as feasible or cost effective.
- After improvements, the resulting conventional rail travel times between city pairs should be faster than traveling by automobile.

The Authority focused its efforts in two primary corridors: Sacramento to Salinas and San Luis Obispo to San Diego. The Sacramento to Salinas corridor passes through Martinez, Oakland, San Jose, and Gilroy. The corridor between San Luis Obispo and San Diego includes Santa Barbara, Oxnard, Los Angeles, and Orange County.

The Authority also considered improvements on the existing San Joaquin Valley service between Oakland and Bakersfield and Sacramento and Bakersfield *(see Figure 5.1)*. Such improvements should be viewed as interim upgrades that high-speed train service would supersede.

The Coastal Corridor between San Jose and San Luis Obispo is slated for state-funded intercity service in the coming two years. The Authority considers such service to be complementary to the high-speed train network and will work with the Coastal Corridor sponsors on coordinating improvements that facilitate both services.

This total approach underscores the tremendous potential high-speed trains have to meet the coming demand in high-speed travel and enhance the overall efficiency of highways, freeways, airports and conventional rail.

5.3 Challenges to Program Implementation

A substantive reason for regarding this work as advisory is that the complex institutional structure in California to implement conventional passenger rail services precludes any one entity from implementing a capital improvement program. Private railroads generally own the corridors reviewed for investment opportunities. Caltrans, Amtrak, commuter rail agencies, and special corridor agencies are involved in funding and operating passenger rail services in these corridors. The Federal Railroad Administration is responsible for regulating the operation of both freight and passenger rail service on these corridors.

One key set of issues will involve gaining FRA approval to increase operating speeds beyond 79 and 90 mph in California. Operators will also need FRA approval regarding grade separations and crossings, cab signalization and the required crashworthiness of passenger rail vehicles. Another significant challenge is posed by the freight railroads, at least two of which plan to increase their operations on affected corridors. Increased levels of both passenger and freight service will present dispatching challenges; operating agreements will also have to be renegotiated. Finally, the individual passenger rail operators will have concerns regarding operating costs, service patterns, and other issues that will need to be addressed.

IMPROVEMENT CATEGORY	Sacramento- Salinas	LA Union Station - San Luis Obispo	LA Union Station - San Diego	Interim San Joaquin Corridor	All Corridors
Track & Signal	$529	$168	$559	$275	$1,531
Grade Crossings	$68	$49	$46	$71	$234
Grade Separations	$160	$100	$160	$100	$520
Stations	-	-	$147	$20	$167
Parking	$34	$12	$15	$16	$77
Rolling Stock	$30	$30	$75	$15	$150
Other	$5	$24	$221	-	$250
TOTAL	$826	$383	$1,223	$497	$2,929

Table 5.1
Investment Opportunities for Conventional Rail Services (millions $1999)

5.4 Investment Opportunities

Owners and operators of services on the identified corridors, including Amtrak and the Caltrans Division of Rail, provided input on the specific improvements necessary to meet the service standards included in the Authority's policies.

Specifically, the improvements would allow conventional passenger trains to achieve greater speeds on certain portions of the corridors and would enhance service reliability greatly. The conventional rail owners and operators also provided the Authority with cost estimates for the recommended improvements. These conventional rail cost estimates were not part of the detailed cost estimation analysis developed as part of the high-speed train financial plan.

The total cost for conventional rail improvements consistent with the Authority's policies is $2.93 billion. *Table 5.1* summarizes the types of improvements and their cost by corridor. The basic types of improvements include track and signal upgrades, grade crossings, grade separations, station improvements, parking facilities, and rolling stock acquisition. In some instances, the improvements include those Caltrans has identified, planned, and programmed, such as tunnel improvements between Chatsworth and Simi Valley, run-through tracks at Los Angeles Union Station and enhancements to the LOSSAN Corridor.

5.5 Travel Time Savings

A key benefit of investing in these passenger rail facilities is the reduction in travel times. *Figure 5.2* identifies the rail time savings for each corridor that can be expected from the investments. The most significant savings are to be found in the Sacramento-Salinas corridor, followed by the Los Angeles-San Luis Obispo corridor and the Interim San Joaquin service.

The time savings estimates were derived with the help of Amtrak and Caltrans Division of Rail and are based on comparing the anticipated operating results of the investments to the current published schedules of the operators. The estimates do not reflect reductions in train delays associated with the investments.

5.6 Opportunities for Intermodal Connections

Connections with other rail and urban transit lines as well as good freeway and highway access will be critical to realizing the promise of a coordinated high-speed transportation system.

The challenge will be to coordinate efforts so that intermodal connections among the various types of transportation can occur in an orderly and efficient manner.

Examples of the types of intermodal development opportunities include:

Downtown Sacramento — The proposed redevelopment of a former Southern Pacific facility adjacent to the current Amtrak station has implications for the proposed high-speed train station in Sacramento and its connections with Capitol Corridor service, Regional Transit light-rail service, and Regional Transit bus service. The site is also adjacent to Interstate 5, which provides good highway access throughout the Sacramento region.

Diridon Station in San Jose — Already the rail hub of the Silicon Valley, Diridon Station is a logical candidate for the San Jose high-speed train station, offering connections to Caltrain, Altamont Commuter Express, Capitol Corridor, and Coast Starlight trains. The Diridon Station is also a likely stop on the planned Vasona light-rail line.

The Entire Caltrain Corridor — Caltrain, the commuter rail operation serving San Francisco and Gilroy along the Peninsula, is undertaking an extensive rehabilitation program that includes electrifying the service. The Caltrain Corridor is the Authority's suggested alignment for serving San Jose to San Francisco. Authority staff and consultants have held preliminary technical discussions with Caltrain staff regarding the engineering, right-of-way and operational coordination necessary for both services to implement their long-range plans.

Los Angeles Union Station (LAUS) — Already identified as the most heavily used station on the high-speed line, Union Station is currently the hub for passenger rail services in Southern California, serving more rail passengers in 1999 than in 1949. Metrolink and Amtrak trains, the Red Line subway, the planned Pasadena Blue Line, and an extensive network of local and regional bus services call on Union Station. Amtrak's and Metrolink's proposed run-through tracks at Union Station offer an example of the type of conventional rail improvements that ultimately could facilitate high-speed train service as well.

Ontario and Burbank Airports — The Authority's high-speed train service proposes stations at both Ontario and Burbank Airports. These proposed stations offer not only high-speed train-air connections; they offer high-speed train-conventional rail connections as well. And the highway and freeway access to both airports extends the reach of high-speed train passengers far beyond the local boundaries of the airports.

Connections with other rail and urban transit lines, as well as good freeway and highway access, will be critical to realizing the promise of a coordinated high-speed transportation system.

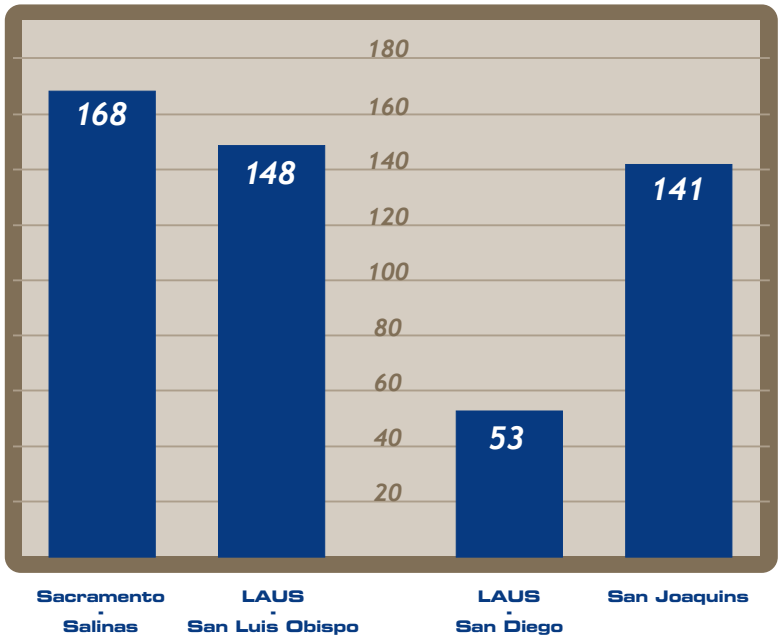


Figure 5.2
Minutes of Rail Travel Time Saved by Corridor Due to Capital Investments

This partial listing of the intermodal connection opportunities between the high-speed train service and conventional rail, transit, and bus services as well as highways and freeways typifies the potential for generating a total approach to transportation for Californians.

6.0 FUNDING AND BUILDING THE SYSTEM

6.1 Two Funding Approaches

This plan presents two approaches to funding the system. The first is a full-funding scenario that assumes a decision to proceed with the entire project is made in 2000. The second approach is a phased-funding approach that focuses on securing those resources required to complete discrete phases of the project as expeditiously as possible.

Both scenarios are consistent with the intent of the Authority's legislative mandate to determine how to construct and operate a high-speed train network. As described in Chapter 2, the engineering, environmental clearance, right-of-way purchase, and construction phases of the project are estimated to take 16 years. This time period and the length of each discrete phase guided the development of both scenarios, which would move the project to its completion in 2016 as expeditiously as possible. Both scenarios would have the same outcome.

Given the 16-year time frame and the opportunities to piece together a financing plan with better knowledge that more appropriately addresses the discrete phases of the project, the phased-funding approach is the most prudent and business-like approach and will ultimately be of better value to the state's taxpayers. Further, this approach is consistent with the way in which transportation projects are funded in California.

The full-funding approach remains a reasonable course of action and represents a "worst-case" funding scenario that is constrained to sources of funds that are defined. The phased-funding approach should overcome these limitations to create a more solid financial foundation for the project.

6.2 Financial Plan Policies

In March 1999, the Authority adopted policies that served as assumptions to guide the development of both funding scenarios. On the one hand, the assumptions portray a "worst-case" full-funding scenario by being limited to sources of funding that are defined and not speculative. On the other hand, these constraints also provide direction on how to approach the phases of the project so that appropriate sources of funding can be targeted most efficiently.

1. *The financial plan shall be prepared with a statewide temporary sales tax as the state revenue source, to the extent that state public funds are needed for the capital costs of building the high-speed train network, and only for so long as they are needed.*

The Authority reviewed three types of statewide revenue-sales tax, gas tax, and general obligation bonds. The Authority rejected general obligation bonds because the state does not have sufficient bonding authority to finance the construction of the project.

The gas tax is not a viable option for three reasons. The first is that the purchasing power of the gas tax has been declining over time. The second reason is that federal environmental mandates require that between five and 10 percent of the state's automobile fleet must be non-polluting vehicles by the middle of the next decade. Presently, non-polluting vehicles are exempt from user fees. Combining the two reasons yields the third: the Authority has difficulty assuming an appropriate level of gas tax to raise the funds necessary over the next 16 years.

As a result, the Authority determined that a statewide sales tax yields the most predictable stream of revenue to fund the capital costs of the project. The emergence of e-commerce is likely to have an impact on sales tax generation over the next two decades that could make estimating the sales tax to be raised as difficult as the gas tax. However, the Authority could not address the issue adequately due to the lack of consensus among economists on what that impact might be.

2. *The financial plan shall presume that the state will fund the base system fully and that no local funding participation shall be assumed in the base system. The Authority shall consider entering into*

intergovernmental agreements with local agencies, should local agencies desire or request location, design, and other station amenities over and above the design standards of the base system. The costs of location, design and other amenities over and above the base system shall be the responsibility of requesting local agencies.

The financial plan does not assume any contribution from local agencies because such contributions would likely come at the expense of other funding. However, cities or regions could leverage an investment in a station location with that of the Authority.

3. *To the extent possible, all parking at high-speed train stations shall be constructed, operated and funded by private operators under agreements with the Authority.*

The projections based upon airport experience show that parking revenues will cover the cost of building parking facilities and that the private sector, rather than the Authority, should be responsible for constructing, operating and financing these facilities.

SOURCES of FUNDS:	(MILLIONS)	
1/4-cent Statewide Sales Tax Revenue	*$18,564*	*70%*
Sales Tax Bond Net Proceeds	*$3,739*	*14%*
Commercial Paper Net Proceeds	*$999*	*4%*
Other Funding Sources	*$723*	*3%*
Interest Earned on Cash Balances	*$2,577*	*9%*
TOTAL	*$26,602*	*100%*
USES of FUNDS:		
Capital Costs	*$24,974*	*94%*
Sales Tax Bond Principal and Interest Payments	*$1,627*	*6%*
Ending Cash Balance	*$1*	*0%*
TOTAL	*$26,602*	*100%*

Table 6.1
Summary of Full-Funding Financing Scenario
($1999, through the end of FY 2016)

4. *The Authority shall diligently seek partnership funding from the federal government to construct the high-speed train system. However, federal grant funding shall not be included in the Authority's financial plan until a funding commitment is expressed by either the Congress or the administration. To the extent feasible, advisable, and cost effective, the Authority should seek federal loans or credit enhancements.*

Because the business plan will be completed after the Transportation Equity Act for the 21st century (TEA-21) and before the next round of federal transportation authorization legislation, no federal grant monies are included. The Authority is considering how to incorporate the federal loan and credit enhancement provisions of the Transportation Infrastructure Finance and Innovation Act (TIFIA). Securing federal funding would significantly alter the full-funding scenario.

5. *The financial plan shall not budget for special freight equipment as part of the initial operating plan. The Authority may consider utilizing the basic passenger train sets for appropriate freight service as market conditions justify and as consistent with the Authority's primary mission of passenger service.*

Freight revenues could be a source of funding for constructing and operating the high-speed train system, if sufficient freight operations were to occur. As a result, only those freight revenues expected to result from moving goods as part of regularly scheduled passenger service are included.

The phased-funding approach is the most prudent and business-like approach and will ultimately be of better value to the state's taxpayers.

6.3 Full-Funding Scenario

The full-funding scenario assumes that a quarter-cent sales tax increase statewide is authorized in November 2000. Because the initial phases of the project require less capital funding than the construction phases, which are estimated to occur six years into the project, the Authority would have the ability to pursue a pay-as-you-go strategy for funding the project development, environmental clearance, and right-of-way phases. It is not until late in the construction phase that a relatively small amount of debt would need to be issued *(see Table 6.1)*.

This scenario assumes that the entire system is constructed simultaneously and is opened on June 30, 2016. The financial plan does not assume any segment would be opened early. Even if a profitable segment could be opened early, based on the projections of the total amount of debt that could be supported by the project's revenues, an early opening would not reduce the need for public investment. In addition, the 16-year project development and construction schedule makes it difficult to leverage operating revenues to pay for initial construction costs.

Robust operating surpluses are forecast, allowing the system to self-finance ongoing service expansions and maintenance *(see Table 6.2)*. The sensitivity analyses discussed in Chapter 3 suggest that there is room for some upside potential in the ridership and revenues currently estimated. These analyses are not of the same caliber as the base ridership and revenue forecasts, but they do underscore the potential for the high-speed train service to produce revenues exceeding $1.7 billion, if certain conditions apply. Should the base forecast be exceeded, the resulting financial flexibility could dramatically alter the public investment assumptions, including the amount and duration of any taxes needed.

Other Revenues

The scenario makes extensive use of other revenue sources. These include the following:

Interest Earnings: Interest earnings on the revenue accumulating during the project development and environmental phase of the project contribute over $2.5 billion. In addition, the plan assumes earnings on bond proceeds awaiting expenditure and debt service reserve funding earnings would be applied to offset capital costs and debt service.

- **Right-of-Way Dedications:** The scenario assumes 15 percent of the right-of-way required is currently in public ownership and will be provided to the system at no cost. This cost avoidance amounts to between $373.5 and $499 million. The actual amount of right-of-way should be assessed as part of the next phase of the project.
- **Leveraged Lease Proceeds:** The scenario assumes the Authority will receive $35.3 million in leveraged lease proceeds representing a three percent (net present value) return on the value of the rolling stock assets. The actual amount received will depend on the type of vehicles and the tax environment at the time of system implementation.
- **Parking Revenue:** The scenario assumes that private parking vendor financing will cover the approximately $190 million cost attributable to the parking facilities, including landscaping and additional site preparation.

	Total Operating Revenues*	Operating Expenses	Net Operating Income
2017	722	551	171
2018	821	551	270
2019	880	551	329
2020	894	551	343
2021	909	551	358
2022	925	655	270
2023	940	578	362
2024	956	578	378
2025	972	579	393
2026	988	579	409
TOTAL	9,007	5,724	3,283

* Includes passenger, freight and concession revenue.
(Note: The sensitivity analyses described in 3.3 outline conditions that might generate greater operating revenues. For example, under significantly greater air and auto travel delays and tripled air fares, high-speed train service operating revenues could exceed $1.7 billion in 2020.)

Table 6.2
Summary of Operating Income (millions $1999)

- **Station Concession Revenue:** The projected triple-net lease revenue the high-speed train stations will generate is approximately $1.5 million annually ($1999).

6.4 Phased-Funding Scenario

The Authority's recommended approach is to pursue funding on an as-needed basis to enable the project to proceed expeditiously. A phased-funding scenario does not assume any delay in the project schedule or the initiation of revenue service. Rather, the strategy focuses on securing the funds necessary to complete the discrete phases of the project.

The next phase is development of a program EIR/Tier I EIS with attendant engineering and environmental work *(see Table 6.3).* This phase would take two years and approximately $25 million to complete.

During the program EIR phase, the Authority or its successor would pursue additional sources of funding in order to finance the remainder of the project, recast the financing plan to reduce the investment of the state's taxpayers, and develop relationships with funding partners to align construction risks and operations rewards. For example:

- The financial plan policies recommend seeking federal funding for the project. Beginning in 2000, California could develop a funding package that could be part of the next federal transportation reauthorization package. Federal funding could be applied to the remaining phases of the project.
- In exercising its franchise and design-build-operate-maintain contracting powers, the Authority could secure private sector resources. Franchise fees, private construction financing, and vendor financing could all be part of a private-sector-financing package that, in conjunction with the federal funding package, could significantly offset the investment ultimately required by the state's taxpayers. Vendor financing need not be limited to equipment manufacturers but could also include power utilities and other major suppliers to the network.

The following phase, which would require a decision to proceed to this phase, would entail preliminary engineering and full environmental clearance. The Authority would complete project EIRs and EISs and prepare the project for construction. This second phase is estimated to cost $350 million.

Purchase of right-of-way, which is estimated to be approximately $2.5 billion, would follow. This phase, along with the construction phase, which is estimated to be approximately $22 billion at this juncture, would require a detailed financing plan that would include the sources described below:

- An investment of state funds;
- A possible investment of federal funds — most likely through participation in the next round of federal transportation authorization; and
- An investment of private funds — most likely through the award of franchises, design-build-operate-maintain contracts and vendor financing.

Robust operating surpluses are forecast, allowing the system to self-finance ongoing service expansions and maintenance.

Table 6.3
Phasing of Capital Expenditures (millions $1999)

ITEM	YEAR 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL	% OF TOTAL
PE/Environmental																		
Program Environmental	10	10															20	0%
Prelim Engr/EIS/EIR			75	100	100	75											350	1%
Right-of-Way							271	542	363	363	816						2,355	9%
Civil Engineering																		
Stations								83	165	165			214	214	214	214	1,269	5%
Line Construction							531	797	797	1,390	1,718	1,718	1,718	1,718	859		11,246	45%
Vehicles							98	98	98	98			196	196	196	196	1,176	5%
Systems																		
Trackwork							22	66	66	66	127	254	254	254	254	127	1,490	6%
Electrification							20	61	61	61	117	233	233	233	233	117	1,369	5%
Signaling and Comm							26	79	79	79	152	304	304	304	304	152	1,782	7%
Support Facilities							30	53	53	15	0	43	43	43	24	0	304	1%
Program Implementation *(Admin, PM & CM)*							181	289	325	361	505	433	505	505	361	144	3,609	14%
TOTAL	10	10	75	100	100	75	1,179	2,068	2,007	2,598	3,435	2,985	3,467	3,467	2,445	950	24,970	98%
% of TOTAL COST	0.04%	0.04%	0.30%	0.40%	0.40%	0.30%	5%	8%	8%	10%	14%	12%	14%	14%	10%	4%		100.48%

6.5 Procurement Considerations

Both the full-funding and phased-funding scenarios assume the use of design-build-operate-maintain contracting. The 16-year schedule will require a procurement plan that maximizes private sector funding participation and risk taking. For example, limitations on public funding may require, among other things, such approaches as fixed-price construction contracts with completion date and long-term operating guarantees.

Three key procurement issues need clarification during the program EIR phase of the project:

- The kind and number of contracts to be used to design, build and operate the high-speed train system.
- How much design work should be performed prior to procuring major private sector partners and at what stage of the environmental review process.
- The form of contract and procurement method to use for each contract. The Authority could manage directly the procurement of civil construction elements, vehicle and systems supply, and maintenance and operations with separate contractors or consortia. Or, the Authority could combine the supply of vehicles, systems, and long-term operations and maintenance into a single “core contract.”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7.1 Reaching Out to Californians

The Authority has sought to communicate with as many Californians as possible about what the system will be, what the process for developing it is, and what role the public has in implementing a high-speed train system for the state.

The Authority is encouraged by public awareness and support for a high-speed train system. Newspaper and television and radio news coverage of the Authority's work has led to nearly half of all Californians becoming aware of the project. In over 300 presentations, workshops and events, thousands of Californians have shared their interest, concerns and hopes for a high-speed train system. Nearly two-thirds of all Californians support building the network with a quarter-cent sales tax increase once they learn what the high-speed train system is.

The communications effort included:

Materials and Web Site

The "Imagine" brochure explains the essential elements of the project. The companion "Imagine" video captures the look and feel of the future network and presents a fast-paced depiction of high-speed trains in California. The quarterly newsletters have served to provide updates of the Authority's actions.

The prime communications tool is the Web site, **www.cahighspeedrail.ca.gov**. The site contains detailed information on not only the Authority's work, but the previous Commission's work as well. In addition, the Web site contains a questionnaire, which has proved extremely useful in generating public feedback, and links to other high-speed train Internet sites around the world. Also, the site enables visitors to view and download consultant work, the quarterly newsletters, and the video. More than 76,500 people visit the Web site monthly.

Presentations and Workshops

The second element of the outreach effort has been presentations and workshops throughout the state to inform Californians about the Authority's efforts and listen to what people have to say about the project. In 1999, the Authority conducted over 200 presentations and workshops attended by more than 15,000 elected officials, regional and state stakeholders, and members of the public. These meetings proved to be a valuable activity to focus on regional issues and concerns associated with developing, constructing and funding the system.

Among the issues discussed in the presentations and workshops were: routes, transportation technology, costs, project financing and alternative transportation systems (air, conventional rail, light-rail, and bus). Business leaders were most interested in the effects on business travel, commerce, jobs, tourism, financing options, and route specifications. Environmental activists were excited about the potential to reduce pollution, but were concerned with construction impacts and urban sprawl. Local and regional government leaders shared their opinions on potential impacts to cities and county governments, integration with existing transportation systems and major airports, competition among local entities over routing, project phasing, and private sector participation. Leaders of ethnic groups were interested in contracting opportunities and integration with existing transportation systems.

In addition, through these meetings the Authority was able to modify and enhance the technical work to ensure that it reflected those issues and concerns. For example, concerns about preserving prime agricultural land and serving the downtowns of major Central Valley cities is reflected in not only the engineering analyses developed but in the Authority's corridor adoption resolutions and recommendations to the Governor and the Legislature. In addition, issues related to how to traverse the Tehachapi Mountains led to ensuring that both the I-5 Grapevine and Palmdale-Mojave alignments will be studied during the environmental phase.

Event Forums

The third element of the outreach effort entailed participation in over 100 community and cultural events throughout the state. The Authority's presence included a display, video, and brochures — all designed to encourage the public to learn more about the proposed network.

In every region, the public appeared interested and enthusiastic about the idea of high-speed trains. Most comments and questions were consistent from one region to the next:

"Is this really going to happen?"

"How much is high-speed rail going to cost the taxpayer?"

"When will it be completed?"

"Where will the route go?"

"How much will it cost to ride?"

However, each region also had concerns that were specific to that area of the state. In the Bay Area, for example, people were more interested in how the system would affect the environment and how it would tie into the regional public transportation system. Northern Californians also saw high-speed trains as an alternative to air travel to Southern California and auto travel to the Bay Area. Southern Californians, on the other hand, were enthusiastic about alleviating current transportation problems, but were less optimistic on the completion of such a complicated project.

Central Valley residents were more concerned about the impact high-speed trains would have on agriculture, the potential of such a service to bring higher-paying jobs to smaller farming communities, and the opportunity for reliable high-speed travel service to the Bay Area and Southern California.

Media Coverage

A key element in communicating the Authority's work has been the effort to inform the state's print and electronic media about the project. Nearly 300 print and electronic stories on the Authority and the high-speed train project have appeared since January 1998.

Major daily papers reporting on the project include: *Los Angeles Times, San Jose Mercury News, San Francisco Chronicle, San Francisco Examiner, The Sacramento Bee, The Oakland Tribune, Daily News* (Los Angeles), *The Orange County Register, The Press-Enterprise* (Riverside), *San Bernardino County Sun, The San Diego Union-Tribune, The Fresno Bee, The Record* (Stockton), *and The Bakersfield Californian.* In addition, print media serving Latino, African-American, and various Asian-Pacific Islander communities have also reported on the Authority's efforts.

Electronic media coverage has been solid given that the project is still in the conceptual stage of development. Interview highlights with Authority members have appeared on KCET's *Life and Times*, Century Cable, Univision, and in coverage on network affiliates, as well as radio stations, in nearly all of California's major media markets.

Nearly two-thirds of all Californians support building the network with a quarter-cent sales tax increase once they learn what the high-speed train system is.

7.2 Asking Californians What They Want in High-Speed Trains

Three ways of asking Californians how they view high-speed trains and what they would like to see in a high-speed train network were developed. The first way was two public opinion surveys, conducted in July-August 1998 and February-March 1999. The second was a series of focus groups held throughout the state in September-October 1998. The third is through an online questionnaire as part of the Authority's Web site. Following is a summary of what Californians have shared with the Authority.

Public Opinion Surveys

The two surveys the Authority conducted reached 3,000 Californians. These surveys found:

- Awareness of the high-speed train project increased from 38 percent in July 1998 to 47 percent in March 1999.
- Californians like the concept of a high-speed train system and are willing to support it — even with the prospect of a tax increase. Sixty-four percent supported the system with a 1/4-cent sales tax increase, while 62 percent supported the system with a 1/2-cent sales tax increase.
- Californians view high-speed trains as most beneficial when the system connects large urban areas and is intermodal — connecting easily with other forms of transportation. The most popular route was Los Angeles to San Francisco, with 69 percent of respondents suggesting it would be very valuable.
- Californians see high-speed trains as a way to protect their quality of life.
- Californians are willing to pay for the construction, but prefer to have the private sector share in the construction costs by a 71 percent to 20 percent margin. Both surveys identified the most persuasive arguments for high-speed trains to include:

  84% Reducing air pollution

  82% California needs to plan new forms of transportation because existing highways, freeways and roads are at or near capacity

  78% Californians need to look 20 years ahead and plan for our children

  74% It will be too expensive to continue to widen roadways in the future

Focus Groups

The Authority conducted eight discussion groups that included 100 respondents, selected randomly through telephone surveys. The discussion groups occurred in Sacramento, Concord, Fresno, Burbank, Riverside, Santa Barbara, Irvine, and San Diego. These sessions took a minimum of two hours and covered a range of issues pertinent to the Authority's work.

The focus group respondents:

- Were very supportive of the idea of building a high-speed train system because it is viewed as a transportation solution in California.
- Were supportive of funding alternatives that include a combination of public and private financing to build the network.
- Felt that High-speed trains are a transportation option to air and auto travel because they are faster, economical, safe, more convenient and more relaxing.

Web Site Questionnaire

The Web site contains a page with two basic questions to Californians: "What do you like about high-speed rail?" and "How would you use high-speed rail?" Following are results from the questionnaire:

What do you like about high-speed rail?

78% Provides a cost-effective alternative to air travel

63% Provides a transportation alternative for commuters

73% Provides an environmentally sound alternative to car and air travel

75% Meets transportation needs of state's growing population

How would you use high-speed rail?

90% Vacation travel

58% Business travel

26% Commuting to work

These Web site results are not designed to be rigorous public opinion surveys. However, they do provide a useful tool for gauging what Californians think, and they reflect the views of those who are interested in learning more about the project.

7.3 Board of Advisors

Another outreach activity was the creation of an external board of advisors comprised of a cross-section of interested Californians. Nominated by individual members of the Authority and approved by the entire Authority, these individuals serve as a further stakeholder feedback vehicle. Membership is open and does not either require or imply support of the project.

Much like the public meetings, forums, and workshops, the meetings of the Board of Advisors are designed to combine an exchange of information about the status of the project with comments, concerns and questions from the board.

Californians view a high-speed train system as a way to protect their quality of life.

8.0 A HIGH-SPEED TRAIN SYSTEM ACTION PLAN

8.1 Conclusion

A combination of a high-speed train system and higher-speed conventional train and bus networks will be essential for meeting the mobility needs of more than 45 million Californians in 2020 and beyond. These combined networks will enhance the street, freeway, and highway systems, as well as the state's major commercial airports, which all will need to expand to meet the projected growth. This should not be a surprise since other areas with comparable circumstances (such as France, Japan, and the Northeast Corridor) have followed this same path.

Meeting the mobility needs of today's population (let alone an estimated increase equal to the current population of Texas) will not be either easy or inexpensive. But, this is an opportunity for Californians to think beyond our experience and plan beyond our tenure. Throughout the state's history, decision-makers and leaders have lived by this dictum. As the century closes, Californians today enjoy the fruits of their visions, hard work and sacrifices. It is our turn to rise to the challenge.

Based on the experience of other countries and projections specific to California, a high-speed train system is a smart investment that would return a benefit of at least two dollars for every public dollar invested. More importantly, once built, the service provided by the system, will yield annual operating surpluses in excess of $300 million. For this venture to achieve its potential and to provide the surplus benefits, it should be planned, built, and operated as if it were a business investment.

Approaching the high-speed train system as a business will require adopting a different mind-set than that which has shaped the planning, building and operating of trains for over a half-century. Rather than seeking to realize primarily social and political objectives, which require substantial public subsidies to construct and operate, the mind-set that drives the development of the high-speed train system should focus on returning substantial financial, economic and environmental benefits for whatever public and private investments are made. Failure to apply the new mind-set to this system will place the high-speed train system in jeopardy of needing greater public capital and requiring operating subsidies.

The Authority's statutory authorization and mandates underscore this new mind-set and require the following essential elements for a successful and profitable high-speed train:

- An entity with sole responsibility to plan, build and operate the system;
- A financing plan that limits public investment to capital construction only;
- An ability to procure the best talents and technology available in the world;
- An ability to enter into design-build contracts; and
- An ability to franchise operations to the private sector.

These essential elements should be preserved in order to achieve the financial, economic and environmental benefits described in this plan.

Some high-speed train services in Europe and Japan have generated sufficient revenues to pay for the construction and operation of those services. California will face a different situation. A high-speed train in California must compete with automobiles and airplanes, which have enjoyed decades of public support. For this reason, the initial segments of

A high-speed train system is a smart investment that would return a benefit of at least two dollars for every public dollar invested.

the high-speed train network will depend on public resources to construct.

The Authority has sufficient information and analyses to conclude that a high-speed train is a smart investment and should proceed quickly. The next step in the development of the system should be carrying out a program EIR. This phase is the logical and appropriate next step in the project for the following reasons:

- The further engineering and environmental analyses that are part of the initial environmental phase of the project will define with greater specificity the high-speed train technology, corridors and station locations included in this plan.
- The official input of federal, state and local agencies about the project, which is required during this phase, will help further hone the capital costs of the project — even though we are assured by the best technical advisors in the world that the system can be built for the $25 billion estimate included in this plan. It is reasonable to anticipate that the federal government would become a financial partner in this project, reducing the capital needs to be borne by the California taxpayer.
- The financial plan will benefit from substantive discussions with the private sector about investing in the project. Potential investors will be most interested in how the ridership and revenue projections compare with those of other agencies and their assessment of the future. For example, the business plan assumes annual growth in intercity air and auto travel of 2.5% and 1.3%, respectively. The Federal Aviation Administration applies an annual growth rate of 3.5% for air travel, and the Federal Highway Administration applies an annual growth rate of 2.0% to highway travel. In addition, the business plan does not assume increases in airport congestion or airfare over the next 20 years over what they are today. Ridership and revenues would be substantially higher if growth rates in airfares and air and highway congestion approach or exceed those used by the above agencies. Higher revenues that result from more congestion or increased airfares would reduce the investment the people of California will need to make.

As daunting as building a high-speed train network in California may seem, proceeding in stages is within the political, policy and procedural grasp of state and regional agencies today. High-speed trains are an accepted and relied-upon element of the national transportation systems of countries California claims as major trading partners. High-speed trains are neither futuristic nor far-fetched; they are essential to the economic vitality and quality-of-life of those very nations California considers friends and competitors

Figure 8.1
Recommended Routes to be Studied in the Environmental Clearance Process

on the world stage. A high-speed train network promises to achieve similar benefits for California.

Whether a high-speed train network is built or not, the reality is that California's decision-makers will need to determine how to provide the infrastructure 45-60-80 million Californians will use in this new century. Providing this infrastructure — transportation, power, water, waste — will take one-to-two decades to complete. However, decisions today, with concrete objectives to be obtained in phases, can yield near-term benefits to be enjoyed in a few years. And those decisions, if planned correctly, can contribute to a system that will accommodate the growth as it occurs. This business plan spells out just such an approach.

8.2 Recommendations

The Authority recommends that the Governor and the Legislature take the following actions to start the state toward a 21st century passenger train network worthy of California's needs, desires, and aspirations. These recommendations are aimed at achieving the goal of an efficient and prudent high-speed train network for the year 2020 and beyond by proceeding as expeditiously and cost-effectively as possible in discrete stages to preserve future options, protect corridors and provide early benefits to the people of California.

1. Initiate a formal environmental clearance process with a state-level program environmental impact report (EIR)/federal-level Tier I environmental impact statement (EIS) on the high-speed train network described in this plan *(see Figure 8.1)*.

Both state and federal law prescribe what is involved in preparing a program EIR and Tier I EIS. The Governor and Legislature should initiate the EIR/EIS effort by allocating $25 million in state funds over the next two fiscal years. By expending $12 million in the 2000-2001 state fiscal year, the Governor and Legislature can set in motion the process to secure the engineering, environmental, and outreach services required by statute. Allocating the remaining $13 million in the 2001-2002 state fiscal year enables completion of this phase of the project according to the timetables set forth in the regulation and statute.

During this phase, detailed engineering work will provide approximately 10 percent of the design. Detailed environmental studies will provide a baseline of data that will serve as the foundation of any further environmental analysis as part of the clearance process. The outreach effort will adhere to state and federal regulations to ensure that not only are Californians provided appropriate notice and opportunity to comment on the project but community and environmental justice issues are appropriately documented as well.

Completion of this phase will enable right-of-way to be preserved through hardship purchases, provide detailed phasing of the construction of the project, establish performance benchmarks to guide procurement of the system, and narrow the statewide corridor alternatives to be included in project specific EIRs/EISs.

At the conclusion of the program EIR/Tier I EIS, decision-makers can reevaluate funding options and strategies based on more detailed analyses and information — as well as the input of stakeholders spanning the spectrum from local cities to neighborhood organizations. If the project is deemed viable at the conclusion of this phase, an additional $350 million would be required over the following three-to-four years to achieve full environmental clearance and achieve a 30 percent level of engineering design. The Authority, or its successor, would then have the option to entertain proposals for the private sector to enter into a design-build contract and a franchise with the private sector to operate and maintain.

2. Increase funding and accelerate planning and programming for intercity and commuter rail improvements that can provide enhanced, higher-speed service to Californians earlier and ultimately become part of the high-speed train network.

At the same time that a formal environmental process is initiated on the high-speed train network, work should begin to improve the current intercity and commuter rail systems to accelerate the introduction of higher-speed conventional passenger train service in the state. In addition, these improvements should be planned to incorporate eventual statewide high-speed train service.

As a principal funding partner in the state's transportation system, the state is in the ideal position to initiate this effort, which is consistent with the mandate embedded in Propositions 108, 111 and 116. The early part of this decade is an auspicious time to explore the opportunities and benefits of higher-speed conventional passenger rail technolo-

gies, especially tilt-train technology in revenue service in Europe and in development in North America. Introducing such technology is consistent with the ideas expressed in this business plan and should be developed in such a manner that the introduction of electrified high-speed train service is a logical next step.

State and regional agencies can implement such an effort, and policies are in place at both levels to accommodate such actions.

3. Begin an aggressive statewide effort to increase federal funding for both conventional and high-speed trains in California. In addition, this effort should include working with the Federal Railroad Administration (FRA) and high-speed train manufacturers to resolve safety and compatibility issues.

Implementing the first two items will necessarily involve federal agencies, principally the FRA, the freight railroads, and train manufacturers. A key planning assumption of the Authority is that the high-speed train system must be physically separate and operated entirely apart from any conventional rail services — even when operating at reduced speeds. Federal regulations dictate that the Authority make this assumption, even though technical and operational strategies to incorporate different levels of rail service on the same tracks have been developed in Europe and Asia.

California should aim toward enabling the safe and efficient sharing of track in the state, particularly in urban areas where sufficient space may not exist to permit separate facilities, as is the case in other parts of the world. The impact of such changes on the costs and operation of the high-speed train service, let alone existing services, would be immensely positive, with the ultimate benefit accruing to California's citizens in the more cost-effective and efficient use of its existing investment in rail. The Governor and the Legislature are key to pursuing such changes at both the federal regulatory and legislative levels, as well as encouraging safer equipment from manufacturers.

Moreover, the impact of high-speed train service in the nation's most populous state — and the world's seventh-largest economy — is in the national interest. California should pursue federal funding that contributes significantly to completing the different phases of the project, assisting state and regional and local entities in incorporating high-speed train service in their areas, and reducing the state's share of the investment in the statewide network.

However, in pursuing federal funding, no existing federally-funded project in the state should be disadvantaged. The additive benefits of the high-speed train system promise to be enormous, and the project is deserving of federal investment on its merits. This, too, is an effort that can begin immediately with existing state and regional agencies.

4. Encourage state, regional and local entities to include high-speed trains in their planning for the future.

Californians have commented to the Authority that they would like to see greater attention paid to planning for the future transportation needs of the state. This does not necessarily mean planning entirely new facilities but making better use of existing highways, freeways, airports, and rail networks. The time is now to incorporate high-speed trains into the state's transportation future and create the opportunities for such a network to fit seamlessly with the highway/freeway, air, and conventional rail networks that exist today.

Given the statutory requirements for the development of 20-year regional transportation plans that conform to air quality findings, the next round of developing such plans should include a statewide high-speed train network, as well as enhanced, higher-speed intercity and commuter rail service. The Southern California Association of Government's 1998 regional transportation plan contains a regional Maglev high-speed train system. This is an excellent beginning that should be enhanced by the inclusion of the state system as part of the region's 2000 plan.

By adding a high-speed train component to the 2000 plans, state, regional and local agencies will be able to incorporate the benefits of the statewide system on a regional basis, most notably the air quality and travel time savings benefits. In addition, inclusion in the plans will help advance the regional and local discussions about locating stations and ensuring adequate transportation access to the stations. Existing state agencies, with some modification of policy, can initiate this effort.

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Timetable Example for 2020

This train schedule represents one of many options for high-speed train service in the year 2020. It illustrates how such a service could provide Californians with frequent, reliable high-speed travel. However, it is only a conceptual timetable based upon potential station locations and the best planning data currently available.

The actual schedule for the year 2020 will depend largely upon the market that exists at that time and will change based on demand, similar to airline schedules.

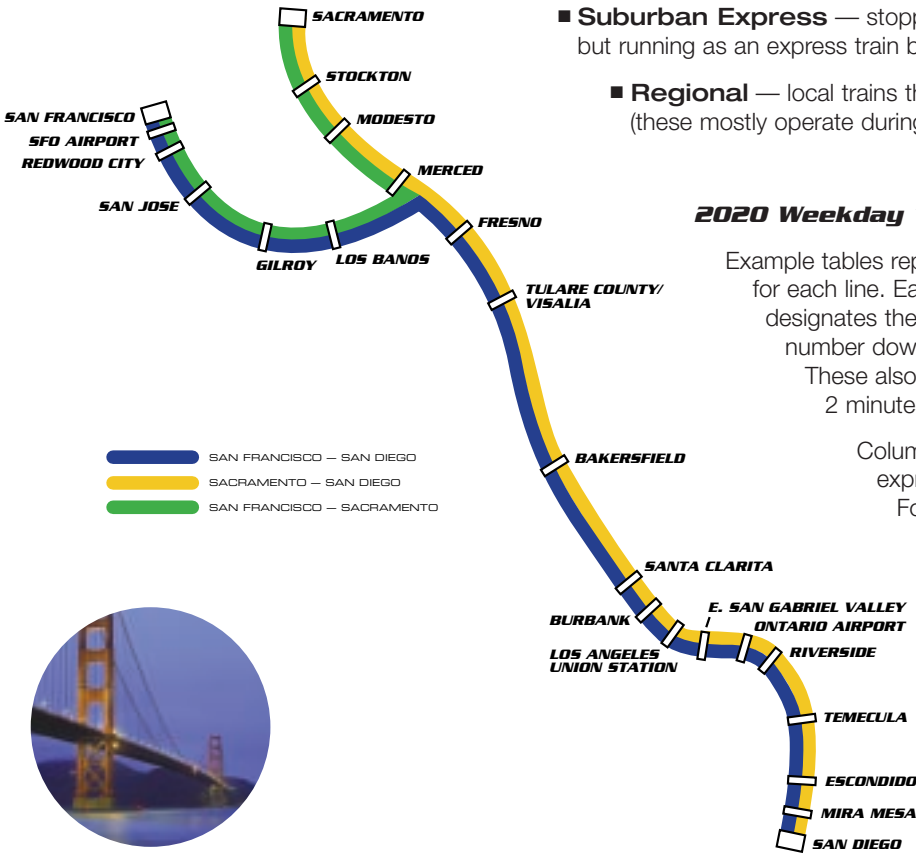
Types of Service:

The example high-speed train system is over 700 miles long and serves 23 stations. Passengers can travel to and from any station using one of three basic lines:

1) San Francisco — San Diego (Blue Line),
2) Sacramento — San Diego (Gold Line), or
3) San Francisco — Sacramento (Green Line).

There are five levels of service:

- **Express** — stopping at one station between origin and destination
- **Semi-Express** — stopping at a limited number of stations
- **Local** — stopping at every station
- **Suburban Express** — stopping frequently within the major metropolitan regions, but running as an express train between them
- **Regional** — local trains that begin or end in the Central Valley (these mostly operate during commute hours)



2020 Weekday Train Schedule:

Example tables representing weekday train schedules for the year 2020 are shown for each line. Each column represents a train. The top number of each column designates the departure time and station location for the train. Each subsequent number down the column represents an arrival time at the next station stop. These also represent boarding times, since the trains will depart promptly 2 minutes after their arrival time.

Columns that have arrows between the arrival times signify an express train. These trains only stop where arrival times are shown. For example, the first northbound Blue Line express train from San Diego leaves at 5:05 a.m. and arrives at Los Angeles Union Station at 6:05 a.m. This train continues as an express train all the way to downtown San Francisco, arriving at 8:37 a.m.

L — LOCAL
E — EXPRESS
R — REGIONAL
S — SEMI EXPRESS
SUB — SUBURBAN EXPRESS

Note: Superscript denotes local service between San Diego and Los Angeles.

Represents an example of statewide weekday train scheduling of future proposed HSR service. Does not represent optimal train timing for all cities served. Based on conceptual operating plan of daily frequency and stopping patterns. No operations modeling or schedule optimization/refinement analysis has been completed for this example. In some cases, train departure times adjusted at intermediate stops to avoid scheduling conflicts.

SAN DIEGO — SAN FRANCISCO NORTHBOUND SERVICE

TRAIN #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
SERVICE TYPE		R	R	L	SUB	SUB	E	S¹	E¹	SUB	SUB	E¹	L	SUB	S¹	E¹	L	E	SUB	E	SUB	S	E	L	S	SUB	E	S	SUB	E	L	SUB	E	S	E	S	SUB	SUB	E	R	E	SUB	L	SUB	L	E	SUB	E	S	L	E
San Diego	SD						505a	500a	525a	535a	615a	635a	645a	710a	720a	730a	740a		815a	905a	915a	1010a	1100a	1050a	1140a	1120a		1220p	1210p	100p	1240p	110p		210p		325p	300p	320p		355p	410p	420p	430p	440p	515p	520p			710p	835p
Mira Mesa	MIR						▾	507a	532a	542a	622a	642a	652a	717a	727a	737a	747a		822a	▾	922a	▾	▾	1057a	▾	1127a		▾	1217p	▾	1247p	117p		▾		▾	307p	327p		402p	417p	427p	437p	447p	▾	527p			717p	▾
Escondido	ESC						▾	517a	542a	552a	632a	652a	702a	727a	737a	747a	757a		832a	▾	932a	▾	▾	1107a	▾	1137a		▾	1227p	▾	1257p	127p		▾		▾	317p	337p		412p	427p	437p	447p	457p	▾	537p			727p	▾
Temecula	TEM						▾	532a	557a	607a	647a	707a	717a	742a	752a	802a	812a		847a	▾	947a	▾	▾	1122a	▾	1152a		▾	1242p	▾	112p	142p		▾		▾	332p	352p		427p	442p	452p	502p	512p	▾	552p			742p	▾
Riverside	RIV						▾	549a	614a	624a	704a	724a	734a	759a	809a	819a	829a		904a	▾	1004a	▾	▾	1139a	▾	1209p		▾	1259p	▾	129p	159p		▾		▾	349p	409p		444p	459p	509p	519p	529p	▾	609p			759p	▾
Ontario	ONT						▾	601a	626a	636a	716a	736a	746a	811a	821a	831a	841a		916a	▾	1016a	▾	▾	1151a	▾	1221p		▾	111p	▾	141p	211p		▾		▾	401p	421p		456p	511p	521p	531p	541p	▾	621p			811p	▾
E. San Gabriel	ESG						▾	613a	638a	648a	728a	748a	758a	823a	833a	843a	853a		928a	▾	1028a	▾	▾	1203p	▾	1233p		▾	123p	▾	153p	223p		▾		▾	413p	433p		508p	523p	533p	543p	553p	▾	633p			823p	▾
Los Angeles	LA			510a	545a	600a	605a	630a	655a	705a	745a	805a	815a	840a	850a	900a	910a	930a	945a	1005a	1045a	1110a	1200p	1220p	1240p	1250p	105p	120p	140p	200p	210p	240p	255p	310p	400p	425p	430p	450p	510p	525p	540p	550p	600p	610p	615p	650p	705p	715p	840p	935p
Burbank	BUR			521a	556a	611a	▾	▾	▾	716a	756a	▾	826a	851a	▾	▾	921a	▾	956a	▾	1056a	▾	▾	1231p	▾	101p	▾	▾	151p	▾	221p	251p	▾	▾	▾	▾	441p	501p	▾	536p	551p	601p	611p	621p	▾	701p	▾	▾	851p	▾
Santa Clarita	SC			536a	611a	626a	▾	▾	▾	731a	811a	▾	841a	906a	▾	▾	936a	▾	1011a	▾	1111a	▾	▾	1246p	▾	116p	▾	▾	206p	▾	236p	306p	▾	▾	▾	▾	456p	516p	▾	551p	606p	616p	626p	636p	▾	716p	▾	▾	906p	▾
Bakersfield	BAK			608a	▾	658a	▾	719a	▾	▾	▾	▾	913a	▾	942a	▾	1008a	▾	1043a	▾	▾	1159a	▾	118p	129p	148p	▾	209p	238p	▾	308p	▾	▾	359p	▾	514p	▾	▾	▾	623p	▾	648p	▾	708p	▾	▾	802p	938p	▾
Tulare	TUL			634a	▾	▾	▾	▾	▾	▾	▾	▾	939a	▾	▾	▾	1034a	▾	▾	▾	▾	▾	▾	144p	▾	▾	▾	▾	▾	▾	334p	▾	▾	▾	▾	▾	▾	▾	▾		▾	714p	▾	734p	▾	▾	▾	1004p	▾
Fresno	FRO	550a	635a	651a	▾	733a	▾	756a	▾	▾	▾	▾	958a	▾	1019a	▾	1051a	▾	▾	▾	▾	1236p	▾	201p	206p	▾	▾	246p	▾	▾	351p	▾	▾	436p	▾	551p	▾	▾	▾		▾	731p	▾	751p	▾	▾	839p	1021p	▾
Los Banos	LB	616a	701a	717a	▾	▾	▾	▾	▾	▾	▾	1024a	▾	▾	1117a	▾	▾	▾	▾	▾	▾	▾	▾	227p	▾	▾	▾	▾	▾	▾	417p	▾	▾	▾	▾	▾	▾	▾	▾		▾	757p	▾	817p	▾	▾	▾	1047p	▾
Gilroy	GIL	632a	717a	733a	747a	808a	▾	▾	▾	907a	947a	▾	1040a	1042a	▾	▾	1133a	▾	1153a	▾	1247p	▾	▾	243p	▾	258p	▾	▾	348p	▾	433p	442p	▾	▾	▾	▾	632p	652p	▾		742p	813p	802p	833p	▾	852p	▾	▾	1103p	▾
San Jose	SJ	647a	732a	748a	802a	823a	▾	844a	▾	922a	1002a	▾	1055a	1057a	1107a	▾	1148a	1132a	1208p	▾	102p	124p	▾	258p	254p	313p	▾	334p	403p	402p	448p	457p	▾	524p	▾	639p	647p	707p	▾		757p	828p	817p	848p	▾	907p	▾	927p	1118p	▾
Redwood City	RC	703a	748a	804a	818a	839a	▾	▾	▾	938a	1018a	▾	1111a	1113a	▾	▾	1204p	▾	1224p	▾	118p	▾	▾	314p	▾	329p	▾	▾	419p	▾	504p	513p	▾	▾	▾	▾	703p	723p	▾		813p	844p	833p	904p	▾	923p	▾	▾	1134p	▾
SFO	SFO	714a	759a	815a	829a	850a	▾	▾	▾	949a	102a9	▾	1122a	1124a	▾	▾	1215p	▾	1235p	▾	129p	▾	▾	325p	▾	340p	▾	▾	430p	▾	515p	524p	▾	▾	▾	▾	714p	734p	▾		824p	855p	844p	915p	▾	934p	▾	▾	1145p	▾
San Francisco	SF	728a	813a	829a	843a	904a	837a	917a	927a	1003a	1043a	1037a	1136a	1158a	1140a	1132a	1229p	1205p	1249p	1237p	143p	157p	232p	339p	327p	354p	335p	407p	444p	505p	529p	538p	525p	557p	630p	712p	728p	748p	740p		838p	909p	858p	929p	847p	948p	935p	100p	1159p	1207p

SAN FRANCISCO — SAN DIEGO SOUTHBOUND SERVICE

TRAIN #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
SERVICE TYPE		R	L	SUB	E	S	SUB	E	SUB	L	SUB	E	S	E	SUB	E	L	SUB	E	SUB	S	L	E	S	E¹	S	E¹	SUB	L	E	S¹	SUB	S	E¹	R	E	SUB	L	R	E	SUB	SUB	SUB	S	SUB	L	E¹	S	L	E
San Francisco	SF		510a	540a	550a	640a	650a	700a	725a	735a	745a	805a	820a	840a	850a	900a	910a	940a	955a	1010a	1100a	1130a	1155a	1210p	1230p	1250p	100p	110p	125p	205p	215p	240p	325p	350p	400p	425p	435p	500p	510p	520p	530p	540p	600p	605p	620p	630p	640p	730p	845p	930p
SFO	SFO		524a	554a	▾	▾	704a	▾	739a	749a	759a	▾	▾	▾	904a	▾	924a	954a	▾	1024a	▾	1144a	▾	▾	▾	104p	▾	124p	139p	▾	▾	254p	▾	▾	414p	▾	449p	514p	524p	▾	544p	554p	614p	▾	634p	644p	▾	▾	859p	▾
Redwood City	RC		535a	605a	▾	▾	715a	▾	750a	800a	810a	▾	▾	▾	915a	▾	935a	1005a	▾	1035a	▾	1155a	▾	▾	▾	115p	▾	135p	150p	▾	▾	305p	▾	▾	425p	▾	500p	525p	535p	▾	555p	605p	625p	▾	645p	655p	▾	▾	910p	▾
San Jose	SJ		551a	621a	▾	711a	731a	▾	806a	816a	826a	▾	851a	911a	931a	▾	951a	1021a	▾	1051a	1131a	1211p	▾	1241p	101p	131p	▾	151p	206p	▾	246p	321p	356p	▾	441p	▾	516p	541p	551p	▾	611p	621p	641p	636p	701p	711p	▾	801p	926p	▾
Gilroy	GIL		606a	636a	▾	▾	746a	▾	821a	831a	841a	▾	▾	▾	946a	▾	1006a	1036a	▾	1106a	▾	1226p	▾	▾	▾	146p	▾	206p	221p	▾	▾	336p	▾	▾	456p	▾	531p	556p	606p	▾	626p	636p	656p	▾	716p	726p	▾	▾	941p	▾
Los Banos	LB		622a	▾	▾	▾	▾	▾	847a	▾	▾	▾	▾	▾	▾	▾	1022a	▾	▾	▾	▾	1242p	▾	▾	▾	▾	▾	▾	237p	▾	▾	▾	▾	▾	512p	▾	▾	612p	622p	▾	▾	▾	▾	▾	▾	742p	▾	▾	957p	▾
Fresno	FRO		648a	▾	759a	▾	▾	▾	913a	▾	▾	939a	▾	▾	1048a	▾	▾	▾	▾	1219p	108p	▾	129p	▾	▾	121p	▾	▾	303p	▾	334p	▾	444p	▾	538p	▾	▾	638p	648p	▾	▾	▾	▾	724p	▾	808p	▾	849p	1023p	▾
Tulare	TUL		705a	▾	▾	▾	▾	▾	930a	▾	▾	▾	▾	▾	1105a	▾	▾	▾	▾	▾	125p	▾	▾	▾	▾	▾	▾	320p	▾	▾	▾	▾	▾	▾	▾	▾	655p		▾	▾	▾	▾	▾	▾	825p	▾	▾	1040p	▾
Bakersfield	BAK	500a	731a	▾	▾	836a	856a	▾	▾	956a	▾	▾	1016a	▾	1056a	▾	1131a	1146a	▾	1216p	1256p	151p	▾	206p	▾	256p	▾	316p	346p	▾	411p	▾	521p	▾	▾	▾	721p		▾	▾	746p	▾	801p	▾	851p	▾	926p	1106p	▾
Santa Clarita	SC	532a	803a	812a	▾	▾	928a	▾	957a	1028a	1017a	▾	▾	▾	1128a	▾	1203p	1218p	▾	1248p	▾	223p	▾	▾	▾	328p	▾	348p	418p	▾	▾	512p	▾	▾	▾	707p	753p		▾	802p	818p	832p	▾	852p	923p	▾	▾	1138p	▾
Burbank	BUR	547a	818a	827a	▾	▾	943a	▾	1012a	1043a	1032a	▾	▾	▾	1143a	▾	1218p	1233p	▾	103p	▾	238p	▾	▾	▾	343p	▾	403p	433p	▾	▾	527p	▾	▾	▾	722p	808p		▾	817p	833p	847p	▾	907p	938p	▾	▾	1153p	▾
Los Angeles	LA	558a	829a	838a	820a	925a	954a	930a	1023a	1054a	1043a	1035a	1105a	1115a	1154a	1130a	1229p	1244p	1225p	114p	145p	249p	225p	255p	305p	354p	330p	414p	444p	435p	500p	538p	610p	620p		655p	733p	819p		750p	828p	844p	858p	850p	918p	949p	910p	1015p	1204a	1200a
E. San Gabriel	ESG	615a	846a	855a	▾		1011a		1040a	1111a	1100a	▾	▾		1211p		1246p	101p		131p		306p	▾	▾	322p	411p	347p	431p	501p	▾	517p	555p	▾	637p		▾	750p	836p			845p	901p	915p	▾	935p	1006p	927p	▾		
Ontario	ONT	627a	858a	907a	▾		1023a		1052a	1123a	1112a	▾	▾		1223p		1258p	113p		143p		318p	▾	▾	334p	423p	359p	443p	513p	▾	529p	607p	▾	649p		▾	802p	848p			857p	913p	927p	▾	947p	1018p	939p	▾		
Riverside	RIV	639a	910a	919a	▾		1035a		1104a	1135a	1124a	▾	▾		1235p		110p	125p		155p		330p	▾	▾	346p	435p	411p	455p	525p	▾	541p	619p	▾	701p		▾	814p	900p			909p	925p	939p	▾	959p	1030p	951p	▾		
Temecula	TEM	656a	927a	936a	▾		1052a		1121a	1152a	1141a	▾	▾		1252p		127p	142p		212p		347p	▾	▾	403p	452p	428p	512p	542p	▾	558p	636p	▾	718p		▾	831p	917p			926p	942p	956p	▾	1016p	1047p	1008p	▾		
Escondido	ESC	711a	942a	951a	▾		1107a		1136a	1207p	1156a	▾	▾		107p		142p	157p		227p		402p	▾	▾	418p	507p	443p	527p	557p	▾	613p	651p	▾	733p		▾	846p	932p			941p	957p	1011p	▾	1031p	1102p	1023p	▾		
Mira Mesa	MIR	721a	952a	1001a	▾		1117a		1146a	1217p	1206p	▾	▾		117p		152p	207p		237p		412p	▾	▾	428p	517p	453p	537p	607p	▾	623p	701p	▾	743p		▾	856p	942p			951p	1007p	1021p	▾	1041p	1112p	1033p	▾		
San Diego	SD	728a	959a	1008a	922a		1124a		1153a	1224p	1213p	1137a	1207p		124p		159p	214p		244p		419p	327p	357p	435p	524p	500p	544p	614p	539p	630p	708p	712p	750p		757p	903p	949p			958p	1014p	1028p	954p	1048p	1119p	1040p	1117p		

SAN DIEGO — SACRAMENTO NORTHBOUND SERVICE

TRAIN #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
SERVICE TYPE		SUB	S¹	L	E¹	SUB	E¹	S	L	SUB	E	SUB	L	SUB	S	E	S	R	E	L
San Diego	SD	450a	515a	545a	600a	625a	700a	835a	840a	1000a		1200p	145p	245p	345p		445p	500p		740p
Mira Mesa	MIR	457a	522a	552a	607a	632a	707a	▾	847a	1007a		1207p	152p	252p	▾		▾	507p		747p
Escondido	ESC	507a	532a	602a	617a	642a	717a	▾	857a	1017a		1217p	202p	302p	▾		▾	517p		757p
Temecula	TEM	522a	547a	617a	632a	657a	732a	▾	912a	1032a		1232p	217p	317p	▾		▾	532p		812p
Riverside	RIV	539a	604a	634a	649a	714a	749a	▾	929a	1049a		1249p	234p	334p	▾		▾	549p		829p
Ontario	ONT	551a	616a	646a	701a	726a	801a	▾	941a	1101a		101p	246p	346p	▾		▾	601p		841p
E. San Gabriel	ESG	603a	628a	658a	713a	738a	813a	▾	953a	1113a		113p	258p	358p	▾		▾	613p		853p
Los Angeles	LA	620a	645a	715a	730a	755a	830a	935a	1010a	1130a	1230p	130p	315p	415p	445p	530p	545p	630p	640p	910p
Burbank	BUR	631a	▾	726a	▾	806a	▾	▾	1021a	1141a	▾	141p	326p	426p	▾	▾	▾	641p	▾	921p
Santa Clarita	SC	646a	▾	741a	▾	821a	▾	▾	1036a	1156a	▾	156p	341p	441p	▾	▾	▾	656p	▾	936p
Bakersfield	BAK	▾	734a	813a	▾	853a	▾	1024a	1108a	1228p	▾	228p	413p	▾	534p	▾	634p	728p	▾	1008p
Tulare	TUL	▾	▾	839a	▾	▾	▾	▾	1134a	▾	▾	▾	439p	▾	▾	▾	▾		▾	1034p
Fresno	FRO	▾	811a	856a	▾	928a	▾	1101a	1151a	103p	▾	303p	456p	▾	611p	▾	711p		▾	1051p
Merced	MER	▾	▾	917a	▾	▾	▾	▾	1212p	▾	▾	▾	517p	▾	▾	▾	▾		▾	1112p
Modesto	MOD	▾	843a	934a	▾	▾	▾	1133a	1229p	▾	▾	534p	▾	643p	▾	▾	743p		▾	1129p
Stockton	STO	822a	855a	946a	▾	1004a	▾	1145a	1241p	139p	▾	339p	546p	617p	655p	▾	755p		▾	1141p
Sacramento	SAC	844a	917a	1008a	941a	1026a	1041a	1207p	103p	201p	239p	401p	608p	639p	717p	739p	817p		849p	1203a

SACRAMENTO — SAN DIEGO SOUTHBOUND SERVICE

TRAIN #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
SERVICE TYPE		R	SUB	SUB	L	E	S	E	S	L	SUB	E¹	SUB	SUB	L	E	SUB	SUB	L	L
Sacramento	SAC		520a	645a	710a	730a	755a	830a	930a	1010a	1145a	1230p	155p	300p	410p	450p	505p	525p	605p	900p
Stockton	STO		542a	707a	732a	▾	817a	▾	952a	1032a	1207p	▾	217p	322p	432p	512p	▾	547p	▾	922p
Modesto	MOD		▾	▾	744a	▾	829a	▾	1004a	1044a	▾	▾	▾	▾	444p	524p	▾	559p	▾	934p
Merced	MER		▾	▾	801a	▾	▾	▾	▾	1101a	▾	▾	▾	▾	501p	▾	▾	▾	▾	951p
Fresno	FRO		▾	▾	822a	▾	901a	▾	1036a	1122a	1243p	▾	253p	▾	522p	556p	▾	631p	▾	1012p
Tulare	TUL		▾	▾	839a	▾	▾	▾	▾	1139a	▾	▾	▾	▾	539p	▾	▾	▾	▾	1029p
Bakersfield	BAK	600a	▾	817a	905a	▾	938a	▾	1113a	1205p	118p	▾	328p	▾	605p	633p	▾	708p	▾	1055p
Santa Clarita	SC	632a	718a	849a	937a	▾	▾	▾	▾	1237p	150p	▾	400p	456p	637p	▾	▾	▾	▾	1127p
Burbank	BUR	647a	733a	904a	952a	▾	▾	▾	▾	1252p	205p	▾	415p	511p	652p	▾	▾	▾	▾	1142p
Los Angeles	LA	658a	744a	915a	1003a	939a	1027a	1039a	1202p	103p	216p	239p	426p	522p	703p	722p	714p	757p	814p	1153p
E. San Gabriel	ESG	715a	801a	932a	1020a	▾			▾	120p	233p	256p	443p	539p	720p	▾		▾		
Ontario	ONT	727a	813a	944a	1032a	▾			▾	132p	245p	308p	455p	551p	732p	▾		▾		
Riverside	RIV	739a	825a	956a	1044a	▾			▾	144p	257p	320p	507p	603p	744p	▾		▾		
Temecula	TEM	756a	842a	1013a	1101a	▾			▾	201p	314p	337p	524p	620p	801p	▾		▾		
Escondido	ESC	811a	857a	1028a	1116a	▾			▾	216p	329p	352p	538p	635p	816p	▾		▾		
Mira Mesa	MIR	821a	907a	1038a	1126a	▾			▾	226p	339p	402p	548p	645p	826p	▾		▾		
San Diego	SD	828a	914a	1045a	1133a	1041a			104p	233p	346p	409p	556p	652p	833p	824p		859p		

SACRAMENTO — SAN FRANCISCO

TRAIN #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SERVICE TYPE		L	L	S	L	S	S	L	L	S	S	L	S	L	S	S	L	S	L
Sacramento	SAC	525a	610a	700a	800a	915a	1000a	1005a	1045a	1100a	1220p	200p	300p	400p	525p	615p	735p	820p	930p
Stockton	STO	547a	632a	▾	822a	▾	▾	1027a	1107a	▾	▾	222p	▾	422p	▾	▾	757p	▾	952p
Modesto	MOD	559a	644a	▾	834a	▾	▾	1039a	1119a	▾	▾	234p	▾	434p	▾	▾	809p	▾	1004p
Merced	MER	616a	701a	▾	851a	▾	▾	1056a	1136a	▾	▾	251p	▾	451p	▾	▾	826p	▾	1021p
Los Banos	LB	633a	718a	▾	908a	▾	▾	1113a	1153a	▾	▾	308p	▾	508p	▾	▾	842p	▾	1038p
Gilroy	GIL	649a	734a	▾	924a	▾	▾	1129a	1209p	▾	▾	324p	▾	524p	▾	▾	859p	▾	1054p
San Jose	SJ	704a	749a	812a	939a	1027a	1112a	1144a	1224p	1212p	132p	339p	412p	539p	637p	727p	914p	932p	1109p
Rewood City	RC	720a	805a	▾	955a	▾	▾	1200p	1240p	▾	▾	355p	▾	555p	▾	▾	930p	▾	1125p
SFO	SFO	731a	816a	▾	1006a	▾	▾	1211p	1251p	▾	▾	406p	▾	606p	▾	▾	941p	▾	1136p
San Francisco	SF	745a	830a	845a	1020a	1100a	1145a	1225p	105p	1245p	205p	420p	445p	620p	710p	800p	955p	1005p	1150p

SAN FRANCISCO — SACRAMENTO

TRAIN #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SERVICE TYPE		L	S	L	S	L	S	S	L	S	L	S	S	L	S	L	S	L	L
San Francisco	SF	530a	600a	625a	650a	735a	945a	1040a	1140a	1245p	140p	300p	340p	400p	455p	515p	620p	800p	940p
SFO	SFO	544a	▾	639a	▾	749a	▾	▾	1154a	▾	154p	▾	▾	414p	▾	529p	▾	814p	1002p
Redwood City	RC	555a	▾	650a	▾	800a	▾	▾	1205p	▾	205p	▾	▾	425p	▾	540p	▾	825p	1014p
San Jose	SJ	611a	631a	706a	721a	816a	1016a	1111a	1221p	116p	221p	331p	411p	441p	526p	556p	651p	841p	1031p
Gilroy	GIL	626a	▾	721a	▾	831a	▾	▾	1236p	▾	236p	▾	▾	456p	▾	611p	▾	856p	1048p
Los Banos	LB	642a	▾	737a	▾	847a	▾	▾	1252p	▾	252p	▾	▾	512p	▾	627p	▾	912p	1104p
Merced	MER	659a	▾	754a	▾	904a	▾	▾	109p	▾	309p	▾	▾	529p	▾	644p	▾	929p	1119p
Modesto	MOD	716a	▾	811a	▾	921a	▾	▾	126p	▾	326p	▾	▾	546p	▾	701p	▾	946p	1135p
Stockton	STO	728a	▾	823a	▾	933a	▾	▾	138p	▾	338p	▾	▾	558p	▾	713p	▾	958	1146p
Sacramento	SAC	750a	745a	845a	835a	955a	1130a	1225p	200p	230p	400p	445p	525p	620p	640p	735p	805p	1020p	1200a

STATIONS		SD		MIR		ESC		TEM		RIV		ONT		ESG		LA		BUR		SC		BAK	
		Adv.	Full	Adv.	Full	Adv.	Full	Adv.	Full	Adv.	Full	Adv.	Full	Adv.	Full	Adv.	Full	Adv.	Full	Adv.	Full	Adv.	Full
San Diego	SD	-	-	-	6	-	8	-	9	17	30	17	31	17	31	18	32	18	33	19	33	20	36
Mira Mesa	MIR	-	6	-	-	-	6	-	8	17	30	17	30	17	31	18	32	18	32	19	33	20	36
Escondido	ESC	-	8	-	6	-	-	-	7	16	29	17	30	17	30	17	31	18	32	18	32	20	35
Temecula	TEM	-	9	-	8	-	7	-	-	-	7	-	8	-	9	-	11	17	31	18	31	19	34
Riverside	RIV	17	30	17	30	16	29	-	7	-	-	-	6	-	7	-	9	16	29	17	30	18	33
Ontario Airport	ONT	17	31	17	30	17	30	-	8	-	6	-	-	-	6	-	8	16	29	16	29	18	32
E. San Gabriel	ESG	17	31	17	31	17	30	-	9	-	7	-	6	-	-	-	7	16	28	16	29	18	32
L.A. Union Station	LA	18	32	18	32	17	31	-	11	-	9	-	8	-	7	-	-	-	6	-	7	17	31
Burbank Airport	BUR	18	33	18	32	18	32	17	31	16	29	16	29	16	28	-	6	-	-	-	6	17	30
Santa Clarita	SC	19	33	19	33	18	32	18	31	17	30	16	29	16	29	-	7	-	6	-	-	17	30
Bakersfield	BAK	20	36	20	36	20	35	19	34	18	33	18	32	18	32	17	31	17	30	17	30	-	-
Tulare/Kings Co.	TUL	22	39	22	39	21	38	21	37	20	36	20	35	19	34	19	33	18	33	18	32	16	29
Fresno	FRO	23	41	22	40	22	40	22	38	21	37	20	36	20	36	20	35	19	34	19	34	17	31
Los Banos	LB	24	43	24	43	24	42	23	41	22	40	22	39	22	39	21	38	21	37	20	36	19	33
Gilroy	GIL	25	45	25	44	24	44	24	42	23	41	23	40	22	40	22	39	21	38	21	38	19	35
San Jose	SJ	26	46	25	46	25	45	24	44	24	42	23	42	23	41	22	40	22	40	22	39	20	36
Redwood City	RC	26	47	26	46	26	46	25	45	24	43	24	43	23	42	23	41	23	41	22	40	21	37
S.F. Airport	SFO	26	47	26	47	26	46	25	45	24	44	24	43	24	42	23	41	23	41	23	40	21	37
Downtown S.F.	SF	27	48	26	47	26	47	26	46	25	44	24	44	24	43	24	42	23	42	23	41	21	38
Merced	MER	24	42	24	42	23	41	23	40	22	39	21	38	21	38	21	37	20	36	20	36	18	33
Modesto	MOD	25	44	24	44	24	43	23	42	23	41	22	40	22	39	21	38	21	38	21	37	19	34
Stockton	STO	25	45	25	45	25	44	24	43	23	42	23	41	23	41	22	40	22	39	21	38	20	35
Sacramento	SAC	26	47	26	47	26	46	25	45	24	44	24	43	24	42	23	41	23	41	22	40	21	37

STATIONS		TUL		FRO		LB		GIL		SJ		RC		SFO		SF		MER		MOD		STO		SAC	
		Adv.	Full	Adv.	Full	Adv.	Full	Adv.	Full	Adv.	Full	Adv.	Full	Adv.	Full	Adv.	Full	Adv.	Full	Adv.	Full	Adv.	Full	Adv.	Full
San Diego	SD	22	39	23	41	24	43	25	45	26	46	26	47	26	47	27	48	24	42	25	44	25	45	26	47
Mira Mesa	MIR	22	39	22	40	24	43	25	44	25	46	26	46	26	47	26	47	24	42	24	44	25	45	26	47
Escondido	ESC	21	38	22	40	24	42	24	44	25	45	26	46	26	46	26	47	23	41	24	43	25	44	26	46
Temecula	TEM	21	37	22	38	23	41	24	42	24	44	25	45	25	45	26	46	23	40	23	42	24	43	25	45
Riverside	RIV	20	36	21	37	22	40	23	41	24	42	24	43	24	44	25	44	22	39	23	41	23	42	24	44
Ontario Airport	ONT	20	35	20	36	22	39	23	40	23	42	24	43	24	43	24	44	21	38	22	40	23	41	24	43
E. San Gabriel	ESG	19	34	20	36	22	39	22	40	23	41	23	42	24	42	24	43	21	38	22	39	23	41	24	42
L.A. Union Station	LA	19	33	20	35	21	38	22	39	22	40	23	41	23	41	24	42	21	37	21	38	22	40	23	41
Burbank Airport	BUR	18	33	19	34	21	37	21	38	22	40	23	41	23	41	23	42	20	36	21	38	22	39	23	41
Santa Clarita	SC	18	32	19	34	20	36	21	38	22	39	22	40	23	40	23	41	20	36	21	37	21	38	22	40
Bakersfield	BAK	16	29	17	31	19	33	19	35	20	36	21	37	21	37	21	38	18	33	19	34	20	35	21	37
Tulare/Kings Co.	TUL	-	-	16	28	17	31	18	32	19	33	19	34	19	35	20	35	17	30	18	31	18	33	19	34
Fresno	FRO	16	28	-	-	16	29	17	31	18	32	18	33	19	33	19	34	16	28	17	30	17	31	18	33
Los Banos	LB	17	31	16	29	-	-	-	7	-	9	-	11	-	12	-	12	16	28	17	30	17	31	18	33
Gilroy	GIL	18	32	17	31	-	7	-	-	-	7	-	8	-	9	-	10	16	29	17	31	18	32	19	34
San Jose	SJ	19	33	18	32	-	9	-	7	-	-	-	6	-	7	-	8	17	31	18	32	19	33	20	35
Redwood City	RC	19	34	18	33	-	11	-	8	-	6	-	-	-	6	-	7	18	31	19	33	19	34	20	36
S.F. Airport	SFO	19	35	19	33	-	12	-	9	-	7	-	6	-	-	-	6	18	32	19	34	19	35	20	37
Downtown S.F.	SF	20	35	19	34	-	12	-	10	-	8	-	7	-	6	-	-	18	32	19	34	20	35	21	37
Merced	MER	17	30	16	28	16	28	16	29	17	31	18	31	18	32	18	32	-	-	16	28	16	29	17	31
Modesto	MOD	18	31	17	30	17	30	17	31	18	32	19	33	19	34	19	34	16	28	-	-	15	28	17	30
Stockton	STO	18	33	17	31	17	31	18	32	19	33	19	34	19	35	20	35	16	29	15	28	-	-	16	28
Sacramento	SAC	19	34	18	33	18	33	19	34	20	35	20	36	20	37	21	37	17	31	17	30	16	28	-	-

Intra-regional or "Commuter" Fares

Intercity Fares (Advanced Purchase = Adv.; Full Fare = Full)

Ticket Prices:

Average expected ticket fares between stations are shown in 1999 dollars. The fares differ according to the distance traveled, and whether or not they are purchased in advance. Actual ticket prices will be developed by the operator based on market conditions, such as distance, time of travel, advanced purchase, and special discounts for frequent travelers, families and seniors. A special "commuter" rate applies to the short-distance trips within the Los Angeles, San Francisco Bay Area and San Diego urban region where stations are spaced much closer together and trains travel at reduced speeds.